PB-224 884/7

EXHAUSTIVE EMISSIONS FROM UNCONTROLLED VEHICLES AND RELATED EQUIPMENT USING INTERNAL COMBUSTION ENGINES. PART 3. MOTORCYCLES

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Southwest Research Institute

Prepared for:

Environmental Protection Agency

March 1973

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BIBLIOGRAPHIC DATA SHEET

1. Report No. APTD-1492

2.

3. PB 224 884/7

4. Title and Subtitle
Exhaust Emissions from Uncontrolled Vehicles and Related Equipment Using Internal Combustion Engines, Part 3: Motorcycles

5. Report Date
March 1973

6.

7. Author(s)
Charles T. Hare and Karl J. Springer

8. Performing Organization Rept. No.

9. Performing Organization Name and Address
Southwest Research Institute
Post Office Drawer 28510, 8500 Culebra Road
San Antonio, Texas

10. Project/Task/Work Unit No.

11. Contract/Grant No.
EHS-70-108

12. Sponsoring Organization Name and Address
ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Water Programs
Office of Mobile Source Air Pollution Control
Ann Arbor, Michigan 48105

13. Type of Report & Period Covered

14.

15. Supplementary Notes

16. Abstracts Exhaust emissions from seven motorcycles were measured using three separate procedures for each bike. The first procedure used for the motorcycle tests was the Federal "7-mode" direct sampling procedure (applicable to 1970 and 1971 model year light duty vehicles), modified where necessary. The exhaust constituents measured for the 7-mode tests included hydrocarbons, CO, CO_2 and NO, all by NDIR. The motorcycles were also tested on the Federal "LA-4" bag sampling procedure (applicable to 1972 and newer light duty vehicles), modified as necessary. This procedure specifies measurement of hydrocarbons by FIA, CO and CO_2 by NDIR, and NO and NO_x by chemiluminescence. The final procedure used was a series of steady-state conditions designed to cover the range of operating conditions experienced by each motorcycle. The exhaust products measured during the steady-state tests included: total hydrocarbons by FIA; light hydrocarbons by gas chromatograph (2 of the 7 machines only); hydrocarbons, (2 of the 7 machines only), CO, CO_2, and NO by NDIR; NO and NO_x by chemiluminescence; O_2 by electrochemical analysis; total aliphatic aldehydes (RCHO) and formaldehyde (HCHO) by the MBTH and chromotropic acid methods, respectively; particulate by an experimental dilution-type sampling device; and exhaust smoke (2-stroke machines only) using a PHS full-flow smokemeter. The motorcycles were operated on a modified automotive chassis dynamometer, and the emissions results are used in conjunction with statistics on motorcycle population and usage to estimate national emissions impact.

17. Key Words and Document Analysis. 17a. Descriptors

Air pollution
Exhaust emissions
Motor vehicles
Tests
Hydrocarbons
Carbon monoxide
Carbon dioxide
Nitrogen oxides
Nitrogen oxide (NO)
Aldehydes
Formaldehyde
Particles
Smoke

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group 13B

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U S Department of Commerce
Springfield VA 22151

18. Availability Statement
Unlimited

19. Security Class (This Report)
UNCLASSIFIED

20. Security Class (This Page
UNCLASSIFIED

21. No. of Pages
174

22. Price
$10.75

1a

APTD-1492

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Part 3: Motorcycles

by

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EPA Project Officer: William Rogers Oliver

Prepared for

ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Water Programs
Office of Mobile Source Air Pollution Control
Ann Arbor, Michigan 48105

March 1973

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Publication No. APTD-1492

FOREWORD

The project for which this report constitutes part of the end product was initiated jointly on June 29, 1970 by the Division of Motor Vehicle Research and Development and the Division of Air Quality and Emission Data, both divisions of the agency known as NAPCA. Currently, these offices are the Characterization and Control Development Branch of MSPCP and the National Air Data Branch of OAQPS, respectively, Office of Air and Water Programs, Environmental Protection Agency. The contract number is EHS 70-108, and the project is identified within Southwest Research Institute as 11-2869-01.

This report (Part 3) covers the motorcycle portion of the characterization work only, and the other items in the characterization work have been or will be covered by six other parts of the final report. In the order in which the final reports have been or will be submitted, the seven parts of the characterization work include: Locomotives and Marine Counterparts; Outboard Motors; Motorcycles; Small Utility Engines; Farm, Construction and Industrial Engines; Snowmobiles; and Gas Turbine "peaking" Powerplants. Other efforts which have been conducted as separate phases of Contract EHS 70-108, including: measurement of gaseous emissions from a number of aircraft turbine engines; measurement of crankcase drainage from a number of outboard motors; and investigation of emissions control technology for locomotive diesel engines; either have been or will be reported separately.

Cognizant technical personnel for the Environmental Protection Agency are currently Messrs. William Rogers Oliver and David S. Kircher, and past Project Officers include Messrs. J. L. Raney, A. J. Hoffman, B. D. McNutt, and G. J. Kennedy. Project Manager for Southwest Research Institute has been Mr. Karl J. Springer, and Mr. Charles T. Hare has carried the technical responsibility.

The offices of the sponsoring agency (EPA) are located at 2565 Plymouth Road, Ann Arbor, Michigan 48105 and at Research Triangle Park, North Carolina 27711; and the contractor (SwRI) is located at 8500 Culebra Road, San Antonio, Texas 78284.

The assistance of several individuals and groups has contributed to the success of the motorcycle portion of this project. To begin, of course, appreciation is expressed to Harley-Davidson Motor Co.; American Honda Motor Co., Inc.; Kawasaki Motors Corp., U.S.A.; U. S. Suzuki Motor Corp.; Triumph Motorcycle Corp.; and Yamaha International Corp. for supplying motorcycles on a loan basis for test purposes. Individuals within these companies who have provided technical assistance include Messrs. Lance Presnall and Nick Hirsch of Harley-Davidson, Brian Gill and Chet Hale of Honda, Dennis David of Kawasaki, Mike Petler of Suzuki; E. W. "Pete" Colman of Triumph, and Leo Lake, Dennis Stefani, and Isao Shirayanagi

of Yamaha. Mr. Roy Kessler of the Motorcycle Industry Council (MIC) has also been very helpful.

Mr. Lake, in his capacity as chairman of the SAE Motorcycle Committee, has also been instrumental in promoting communication by scheduling meetings of his committee at the contractor's facility. These meetings have provided an excellent forum for presentation of progress reports to the motorcycle industry and a good opportunity for exchange of technical information.

The SwRI personnel involved most deeply in preparation for and conduct of the motorcycle tests included Russel T. Mack, lead technician, and Jim Chessher, Gene Hoyt, John T. Jack, Wm. P. Jack, Joyce McBryde, Del Ray O'Neill, and Joyce Winfield. The contributions of all these people were necessary and are sincerely appreciated.

TABLE OF CONTENTS

Page

LIST OF ILLUSTRATIONS vii

LIST OF TABLES ix

ABSTRACT xii

I. INTRODUCTION 1

II. OBJECTIVES 2

III. INSTRUMENTATION, METHODS, AND CALCULATION TECHNIQUES 3

- A. Road Testing and Dynamometer Simulation 4
- B. Federal "7-Mode" Cycle Gaseous Emissions Measurement Procedure (Applicable to 1970 and 1971 Model Year Light Duty Vehicles) 7
- C. Federal "LA-4" Cycle Gaseous Emissions Measurement Procedure (Applicable to Light Duty Vehicles of 1972 Model Year and Later) 8
- D. Steady State Emissions Measurement Procedures 10
- E. Special Study of Crankcase or "Blowby" Emissions from One 4-Stroke Machine 17
- F. Estimation of Unmeasured Emissions 19
- G. Motorcycle Noise Measurement Procedure 22

IV. EMISSIONS TEST RESULTS 24

- A. Gaseous Emissions 24
- B. Smoke Emissions (2-stroke engines only) and Particulate Emissions 42
- C. Results of Noise Tests 45

V. ESTIMATION OF EMISSION FACTORS AND NATIONAL IMPACT 48

- A. Analysis of the Motorcycle Population 48
- B. Development of Emission Factors 52
- C. Estimation of National Impact 55

TABLE OF CONTENTS (Cont.)

Page

VI. SUMMARY 57

LIST OF REFERENCES 59

APPENDIXES

A. Motorcycle Road Test and Dynamometer Simulation Data

B. Shift Points Used for Motorcycle 7-Mode Tests and Motorcycle 7-Mode Emissions Data (1970 Federal Light-Duty Vehicle Procedure)

C. Motorcycle LA-4 Emissions Data (1975 Federal Light-Duty Vehicle Procedure)

D. Gaseous Emissions Data from Steady-State Tests on Motorcycles

E. Reproductions of Speed and Smoke Opacity Traces for the 2-Stroke Motorcycles Operated on the LA-4 Route

LIST OF ILLUSTRATIONS

Figure		Page
1	Modified Automobile Chassis Dynamometer Used for Motorcycle Emissions Tests	5
2	Variable Inertia Simulation System Used for Motorcycle Emissions Tests	5
3	System of NDIR Instruments Used for 7-Mode Tests on Motorcycles	5
4	Motorcycle Operator Following Strip Chart Driving Aid During Emission Test	9
5	Instrument Cart Used for Analysis of Bag Samples	9
6	Constant Volume Sampler Connected to Honda SL100 Motorcycle During LA-4 Emissions Test	9
7	Technician Removing Dilute Sample Bags from Constant Volume Sampler	9
8	Overall View of Gaseous Emissions Analysis System Used for Steady-State Motorcycle Tests	13
9	Detailed View of Continuous Analysis/Readout System Used for Steady-State Motorcycle Tests	13
10	Configuration of Special Exhaust Systems Used for Motorcycle Gaseous Emissions Tests	14
11	Overall Front View of Particulate Sampler Used for Motorcycle Tests	16
12	Detail View of Controls and Readouts Used on Particulate Sampler	16
13	Rear View of Particulate Sampler Set Up for Tests on Kawasaki 125F-6	16
14	First View of Smoke Measurements Being Taken on Kawasaki 125F-6 Motorcycle	18
15	Second View of Smoke Measurements Being Taken on Kawasaki 125F-6 Motorcycle	18

LIST OF ILLUSTRATIONS (Cont.)

Figure		Page
16	Bag Sample of Blowby Gases Being Taken from Honda SL100 at Idle	20
17	Overflow Bag and Other Parts of Continuous Blowby Analysis System Used on Honda SL100	20
18	Noise Measurement on Honda SL100 Motorcycle from Side 1 During Right-to-Left Acceleration Run	20
19	Noise Measurement on Honda SL100 Motorcycle from Side 1 During Left-to-Right Acceleration Run	20
20	Idle Noise Being Measured from the Rear of the Kawasaki 125F-6 Motorcycle	23
21	Idle Noise Being Measured from the Left Side of the Kawasaki 125F-6 Motorcycle	23
22	Envelopes of Road-Load Exhaust Emissions from the Seven Motorcycles Tested	36

LIST OF TABLES

Table		Page
1	Description of Test Motorcycles	3
2	Nominal Fuel Tank Capacities for Various Sizes of Motorcycles	21
3	Summary of Average Motorcycle 7-Mode Trip Composite Results	25
4	Summary of Results of Federal Light-Duty Vehicle Emissions Test Procedure for 1972 and Beyond as Applied to Motorcycles	27
5	Data on NO_x Emissions from 4-Stroke Motorcycles Supplied by Yamaha Motor Co.	28
6	Summary of Constant-Speed Gaseous Emissions Data for the Harley-Davidson FLH Motorcycle, Average Values for 3 Runs	29
7	Summary of Constant-Speed Gaseous Emissions Data for the Honda CL350K3 Motorcycle, Average Values for 2 Runs	30
8	Summary of Constant-Speed Gaseous Emissions Data for the Honda SL100 Motorcycle, Average Values for 8 Runs	31
9	Summary of Constant-Speed Gaseous Emissions Data for the Kawasaki 125F-6 Motorcycle, Average Values for 5 Runs	32
10	Summary of Constant-Speed Gaseous Emissions Data for the Suzuki T250 Motorcycle, Average Values for 4 Runs	33
11	Summary of Constant-Speed Gaseous Emissions Data for the Triumph T120R Motorcycle, Average Values for 3 Runs	34
12	Summary of Constant-Speed Gaseous Emissions Data for the Yamaha DT1-E Motorcycle, Average Values for 2 Runs	35
13	Data on Light Hydrocarbon Emissions From a Honda SL100 Motorcycle	38

LIST OF TABLES (Cont.)

Table		Page
14	Data on Light Hydrocarbon Emissions from a Kawasaki 125F-6 Motorcycle	38
15	Conditions and Weighting Factors Used for Cycle Simulation	39
16	Cycle Composite Aldehyde Emissions from Motorcycles	39
17	Crankcase Vent Emissions From a Honda SL100 Motorcycle	40
18	Mass Emissions From the Crankcase Vent of a Honda SL100 Motorcycle	41
19	Exhaust Emissions From a Honda SL100 Motorcycle With and Without Blowby Recirculation	41
20	Summary of Results of the Crankcase Emissions (Blowby) Study Conducted on the Honda SL100	42
21	Motorcycle Smoke Test Results and Supplementary Data	43
22	Particulate Emissions Data from Seven Motorcycles	44
23	Summary of Weighted Particulate Mass Emissions from Seven Motorcycles	45
24	Summary of Noise Test Results on Three Motorcycles	46
25	Summary of Motorcycle Registration and Sales Data	48
26	Motorcycle Population Statistics Calculated By Assuming a Series of Retirement Rates	50
27	Breakdown of U.S. Motorcycle Population According to Engine Size and Type	51
28	Distribution of U.S. Motorcycles by Engine Size	51
29	Typical Mass Emissions From Motorcycles as Functions of Engine Size and Type	52
30	Emission Factors for Motorcycles (Dec. 31, 1972)	54

LIST OF TABLES (Cont.)

Table		Page
31	National Impact Estimates for Motorcycle Emissions (Dec. 31, 1972)	55
32	Comparison of Motorcycle National Impact Estimates With EPA Nationwide Air Pollutant Inventory Data	56
33	Summary of Seasonal, Regional, and Urban-Rural Variation of Motorcycle Emissions	56

ABSTRACT

This report is Part 3 of the Final Report on Exhaust Emissions from Uncontrolled Vehicles and Related Equipment Using Internal Combustion Engines, Contract EHS 70-108. Exhaust emissions from seven motorcycles were measured using three separate procedures for each bike. The motorcycles tested were a Harley-Davidson FLH (1200cc), a Honda CL350K3, a Honda SL100, a Kawasaki 125F6, a Suzuki T250, a Triumph T120R (650cc), and a Yamaha DT1E (250cc). Although two of the procedures used for testing were based on those specified in Federal Law for automobiles, it should be noted that motorcycles are currently exempt from Federal emissions regulations.

The first procedure used for the motorcycle tests was the Federal "7-mode" direct sampling procedure (applicable to 1970 and 1971 model year light duty vehicles), modified where necessary. The exhaust constituents measured for the 7-mode tests included hydrocarbons, CO, CO_2 and NO, all by NDIR. The motorcycles were also tested on the Federal "LA-4" bag sampling procedure (applicable to 1972 and newer light duty vehicles), modified as necessary. This procedure currently specifies measurement of hydrocarbons by FIA, CO and CO_2 by NDIR, and NO and NO_x by chemiluminescence. The final procedure used was a series of steady-state conditions designed to cover the range of operating conditions experienced by each motorcycle. The exhaust products measured during the steady-state tests included: total hydrocarbons by FIA; light hydrocarbons by gas chromatograph (2 of the 7 machines only); hydrocarbons, (2 of the 7 machines only), CO, CO_2, and NO by NDIR; NO and NO_x by chemiluminescence; O_2 by electrochemical analysis; total aliphatic aldehydes (RCHO) and formaldehyde (HCHO) by the MBTH and chromotropic acid methods, respectively; particulate by an experimental dilution-type sampling device; and exhaust smoke (2-stroke machines only) using a PHS full-flow smokemeter.

The motorcycles were operated on a modified automotive chassis dynamometer, and the emissions results are used in conjunction with statistics on motorcycle population and usage to estimate national emissions impact.

I. INTRODUCTION

The program of research on which this report is based was initiated by the Environmental Protection Agency to (1) characterize emissions from a broad range of internal combustion engines in order to accurately set priorities for future control, as required, and (2) assist in developing more inclusive national and regional air pollution inventories. This document, which is Part 3 of what is planned to be a seven-part final report, concerns emissions from motorcycles and the national impact of these emissions.

Prior to the work reported here, very little well-documented motorcycle emissions research had been made public, although doubtless some unpublished work had been done. The results which were available were also generated by procedures originally developed for passenger cars, some of which were valid for motorcycles and others which were not. Several procedures were used for motorcycle testing in the subject program to gather the most useful results, but little consideration has been given to the potential usefulness of these procedures for anything except research purposes.

Due to arrangements within the contract, the motorcycle testing was performed during three essentially separate time intervals. Some of the 7-mode tests were performed on five motorcycles (all except the Honda SL100 and Kawasaki 125F-6) during April and May 1971. At that point the personnel involved were assigned to on-site testing of aircraft turbine engines until about September 1971, so the remainder of the testing on the same five machines was accomplished from September 1971 through early January, 1972. The third section came after the most recent contract modification, extending from August through October of 1972, and it included all testing on the Honda SL100 and the Kawasaki 125F-6. All the tests were performed in the Emissions Research Laboratory at SwRI except the road tests and noise tests.

II. OBJECTIVES

The objectives of the motorcycle part of this project were to obtain exhaust emission data on a variety of motorcycles, and to use these data along with available information on number of machines in service and annual usage to estimate emission factors and national impact. The emissions to be measured included total hydrocarbons (FIA); CO, CO_2, NO and hydrocarbons (NDIR); NO_x and NO (chemiluminescence); O_2 (electrochemical); light hydrocarbons (gas chromatograph); aldehydes (wet chemistry); particulates (gravimetric analysis); and smoke for 2-stroke machines only (PHS light extinction smokemeter). These exhaust constituents are essentially the same as those measured during all tests on gasoline-fueled engines tested under this contract.

In order to obtain comprehensive data, it became necessary to operate the motorcycles on modified versions of cyclic procedures originally designed for automobiles, as well as steady-state procedures designed specifically for the motorcycles. The modified cyclic procedures gave useful results for constituents which could be analyzed continuously and which did not degrade with time in bag samples, but they could not be used to measure constituents which required relatively lengthy sample collection periods or which decomposed or settled out with time. To meet the objective of obtaining good emissions data, it was necessary to develop representative steady-state procedures which could be weighted by mode to derive composite emissions of difficult-to-measure constituents such as aldehydes and particulates. This development became a secondary objective of the project.

III. INSTRUMENTATION, METHODS, AND CALCULATION TECHNIQUES

This report section covers the conduct of the road tests and dynamometer simulation, all the emission measurements, calculation of unmeasured constituents, and the noise tests. It includes photographic documentation of all the studies as well as descriptions, and is broken into seven major subsections for clarity. In brief, the test procedures were chosen to yield as much useful data and as many comparisons to other emission sources as possible. The steady-state tests permitted acquisition of data on emissions which require an extended sampling period (aldehydes, particulate, and light hydrocarbons), in addition to providing an assessment of the stability of emissions which can be measured continuously. The 7-mode tests were included to attempt comparison to motorcycle work done previously, and they could also be useful in determining emissions variations and average concentrations during transients. The LA-4 (1972 and later Federal) tests were included because this procedure is the current Federal standard for light-duty vehicles, and thus is probably the most reliable way to estimate national emissions impact of motorcycles.

The seven motorcycles tested were chosen to represent a variety of sizes and types, including both 2-stroke and 4-stroke machines. Descriptions of the bikes are given in Table 1, and it should be noted that the five larger machines were 1971 models and that the two smaller ones were 1972 models. Although the machines tested were some of the most popular types, no attempt was made to correlate exactly with the national

TABLE 1. DESCRIPTION OF TEST MOTORCYCLES

Manufacturer	Model	Cyls.	Nom. Disp., cm^3	Wt., lb_f	Engine Type	Chassis Type	Nominal Max hp at rpm
Harley-Davidson	FLH	2	1200	697	4-stroke	street	*57 @ 5,000
Honda	CL350K3	2	350	355	4-stroke	street	33 @ 9,500
Honda	SL100	1	100	220	4-stroke	dual-purpose	11.5 @ 11,000
Kawasaki	125F-6	1	125	248	2-stroke	dual-purpose	*15 @ 7,500
Suzuki	T250	2	250	339	2-stroke	street	32 @ 8,000
Triumph	T120R	2	650	417	4-stroke	street	50 @ 6,500
Yamaha	DT1-E	1	250	279	2-stroke	dual-purpose	23 @ 7,000

*approximate - not from manufacturer's data population. A much larger number of motorcycles would be necessary to form any kind of statistical sample of the population.

A. Road Testing and Dynamometer Simulation

The reason for conducting road tests on the motorcycles, including accelerations and decelerations, is to make sure that the subsequent dynamometer inertia and road load settings will permit the machines to operate as normally as possible. The same comment applies, of course, to speedometer calibrations. Since the subject work is perhaps the first fairly comprehensive study of motorcycle emissions to be widely circulated, care has been taken to document the process used in setting up the motorcycles for dynamometer operation. Making the dynamometer simulation data available in this manner will allow the process to be judged properly in retrospect, and if errors are found, the emissions data can be corrected for the errors and still be usable.

The dynamometer used was an old Clayton model C-49 unit, having 7-inch diameter rolls about 80 inches long. The actual inertia of the rolls is not known, but they are partially hollowed out rather than being solid. The unit was modified to reduce the roll spacing to 12 inches on centers, preventing the tire of the motorcycle from sinking too far down between the rolls. The inertia system was fabricated especially for motorcycles, consisting of six steel discs which could be selectively coupled to the rolls. For tests on the smaller machines (Honda SL100 and Kawasaki 125F-6), the inertia wheels turned at the same rotational speed as the rolls, but they were driven at twice the roll speed for the five larger machines. The dynamometer and the inertia wheels are shown in Figures 1 and 2, respectively (the inertia system was covered by a guard when in operation). Referring to Figure 2, the three larger wheels were 20 inches in diameter, and were designated numbers 1, 2, and 3 in order of decreasing thickness. The smaller wheels were 16 inches in diameter, and were designated 4, 5, and 6 in order of decreasing thickness. Wheels 1 and 4 were 1/2 inch thick, 2 and 5 were 3/8 inch thick, and 3 and 6 were 1/4 inch thick. The water brake power absorption unit is under the plate at the right end of the dynamometer in Figure 1, and the white console contains speed (mi/hr) and power absorption (hp) readouts.

In the case of the dynamometer as well as some other equipment items used during the subject study, time and financial constraints combined to prevent equipment from being optimized. Another item which was a compromise was the blower used for engine cooling. To simulate the real situation properly, the blower should provide airflow over the engine proportional to road speed, but the blower used for this project was not so controlled. During idles, the blower was shut off, and it was unrestricted during other conditions. The most important function of the

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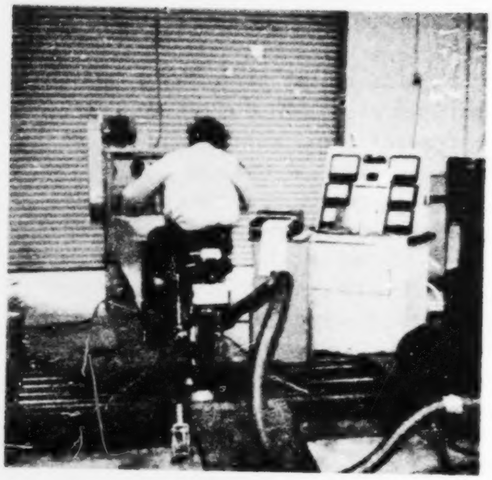


Figure 1. Modified Automobile Chassis Dynamometer Used for Motorcycle Emissions Tests

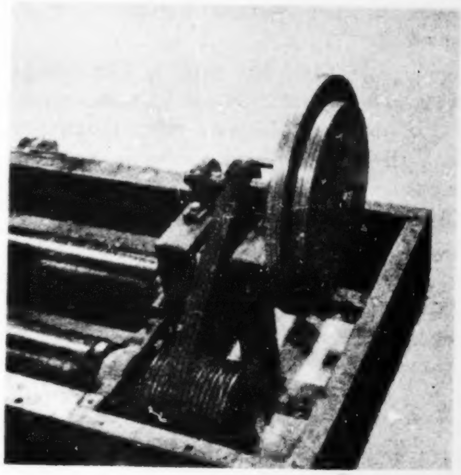


Figure 2. Variable Inertia Simulation System Used for Motorcycle Emissions Tests

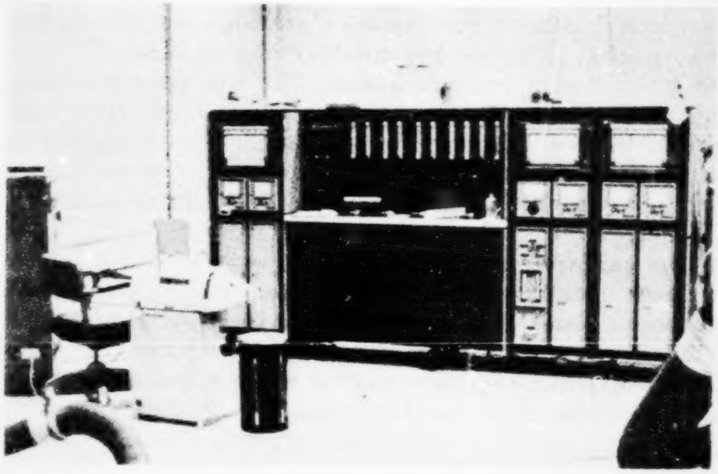


Figure 3. System of NDIR Instruments Used for 7-Mode Tests on Motorcycles

blower during the subject tests was to provide sufficient cooling air to prevent engine damage, and any side-effects on emissions which may have occurred will simply have to be accepted as experimental error until further tests are run using more sophisticated equipment.

Data taken during the road test and dynamometer simulation operation are given in Appendix A, pages A-2 through A-8. The first step for each motorcycle was to calibrate its speedometer. All subsequent work was then performed at true speeds rather than indicated speeds. The motorcycles were weighed with full liquid levels, and these weights (plus an assumed 150 pound rider) were used later to determine power requirements for simulated uphill conditions (steady-state tests). Inlet vacuum was recorded next (five machines only), on a level course in the indicated gears. These data were of limited value, so they were not acquired for the last two bikes tested (Honda SL100 and Kawasaki 125F-6).

The coasting times (or "rundown" times, as they are commonly called) were measured on a flat course, the process requiring two technicians. Taking the data on page A-3 for the Honda CL350K3 as an example, Operator R rode by Operator D (who was standing beside the road) at a true 40 mph and pulled in the clutch in view of Operator D. Operator D started a stopwatch when the clutch was disengaged, and continued watching the motorcycle from the rear. When a true 20 mph was reached, Operator R touched the rear brake pedal, causing the taillight to flash, and Operator D stopped the watch. Operator R turned the bike around and repeated the procedure in the other direction, and then the operators changed places and repeated the two runs. The 20 mph and 40 mph speeds were chosen only as a matter of convenience, because each of the five larger bikes had at least one gear in which it would accelerate well at wide open throttle from 20 mph to 40 mph. It was considered desirable to run the accelerations and the rundowns between the same two speeds. For the two smaller motorcycles, 25 mph and 45 mp proved to be more convenient endpoints. The one-gear accelerations were run in a manner similar to the coasting tests, with the rider beginning the acceleration in view of the stationary observer and tapping the rear brake when the speed reached the true end value. The accelerations were limited to one gear to eliminate the effect of shifting variations.

The data gathered in the road test were used to set up the dynamometer for both constant-speed and transient operation. The inlet vacuum tests were repeated with the bike on the dynamometer and in all cases the vacuum readings indicated that dynamometer friction was just about equal to level road resistance; so it was not necessary to add any additional dynamometer load for the "road load" settings (resulting in the blank columns at the bottom right of the test data sheets). An additional indication of the accuracy of the road load simulation was provided by the acceleration and rundown tests, as will be explained shortly.

The next step was to determine which inertia wheel (or combination of wheels) was necessary to properly simulate road performance during transient conditions. This procedure was of the trial-and-error type, and in all cases the last wheel or combination of wheels listed on the data sheet was the one used during the 7-mode and LA-4 cycles. Looking at the data for the Honda CL350K3 again, wheel number 4 was tried first, resulting in both acceleration and deceleration times which were too short. This outcome meant that the wheel did not have enough inertia, so a wheel having higher inertia (no. 2) was tried. In this second trial, the deceleration time was a little short and the acceleration time was a little bit high. This outcome meant that the inertia was about right, but that the dynamometer friction was a bit greater than road load between 20 mph and 40 mph. If, as an example, the acceleration time had been low and the deceleration time had been high, dynamometer friction would have been lower than road load over the speed range investigated. This reversal occurred markedly only for the Suzuki T250 (although it occurred to a lesser extent for the Honda SL100 and the Kawasaki 125F-6), and it was later discovered that the apparently greater "road load" for the Suzuki had been due to a dragging front brake. A similar but opposite problem seemed to be occurring with the Kawasaki 125F-6, but in this case the restraints were simply snubbed down too tightly, creating an artificial additional amount of dynamometer friction.

Three of the motorcycles tested (Honda SL100, Kawasaki 125F-6, and Yamaha DT1-E) were of the "dual purpose" type, and were fitted with one variety or other of semi-knobby rear tires as standard equipment. These "dirt" tires were replaced with street tires to reduce dynamometer friction and to prevent tire disintegration, so the effective overall gear ratios of the three machines may have been changed slightly as a result.

B. Federal "7-Mode" Cycle Gaseous Emissions Measurement Procedure (Applicable to 1970 and 1971 Model Year Light Duty Vehicles)

The major reasons for running the motorcycles on the 7-mode cycle(1) were to permit correlation with earlier emissions tests and to obtain data on average emission concentrations during certain transient conditions. It was discovered quite early in the tests that use of the empirical equation relating exhaust volume to vehicle mass was not practical because it gave inaccurate (low) results for motorcycles. The effect of this problem was that calculation of emissions on a mass basis from 7-mode results had to be eliminated, which was no great loss since the other measurement procedures gave good results to fill in the gap.

As required by the 7-mode procedure, shift points were standardized for each motorcycle according to what was considered its normal operation. These shift points are outlined on pages B-2 through B-5 of Appendix B, and show considerable variations from one motorcycle to another, as a function of engine size, gearing, and so forth.

The 7-mode procedure (which applied to light-duty vehicles up through the 1971 model year, excluding motorcycles) specified direct exhaust sampling for hydrocarbons, CO, CO_2, and NO (1971 only), so these constituents were the ones measured (all by NDIR analysis). The instrumentation system used is shown in Figure 3, along with a teletype terminal and on-line computer (left) used for processing of information from other types of emissions tests. The system had the high flowrates and fast response required by law for certification work, and data analysis was performed by hand-integrating the strip chart readouts and processing the results by computer from that point (see Appendix B, pages B-6 through B-37 for computer printouts). To help the operator drive the cycle correctly, he watched a strip chart driving aid with a pen to follow the speed-time trace as shown in Figure 4. A similar driving aid was used for the LA-4 runs. The fuel used for the 7-mode tests as well as all the other procedures was standard emissions test fuel(2), similar to the brand-name product "Indolene 30."

C. Federal "LA-4" Cycle Gaseous Emissions Measurement Procedure (Applicable to Light Duty Vehicles of 1972 Model Year and Later)

This newer procedure(2), which uses constant-volume sampling, was much more readily adapted to use in motorcycle testing than was the older 7-mode procedure. Calculations were more direct and less time-consuming, and the composite mass-based results were quite believable. The major drawback of the bag sampling procedure is that it provided no data on individual modes, which made it more useful for determination of impact than for characterization studies. The instrumentation specified for this procedure is NDIR analysis for CO and CO_2, FIA analysis for total hydrocarbons, and chemiluminescent analysis for NO_x. The instrument cart used for the bag analysis is shown in Figure 5, and the constant volume sampler (CVS) is shown in Figure 6 as connected to the Honda SL100 during an LA-4 emissions test. Figure 7 is a more detailed view of the CVS, with the air inlet at upper left, filtration system inside the stainless steel box, and pressure and temperature readouts on the panel and shelf in front of the technician.

For the motorcycle tests, the positive-displacement blower used to pull air/exhaust mixture through the CVS was run more slowly than it would have been for automobile tests to provide reasonable emission concentrations for measurement. The total volume flowrate through the system was about 93 CFM, of which a small fraction was removed to fill the sample bags. The calculation procedure used to arrive at grams per mile from the raw data was essentially that which becomes applicable to light-duty vehicles of 1975 and later model years(3). The

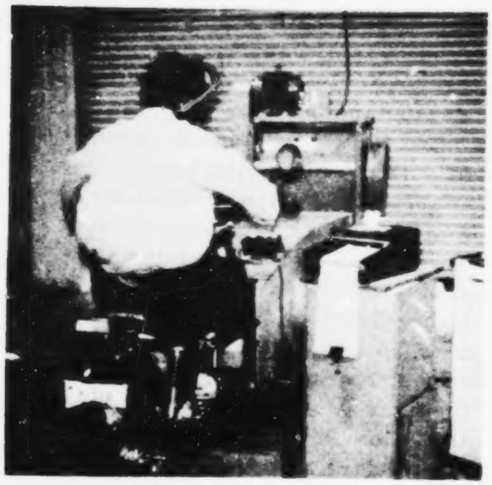


Figure 4. Motorcycle Operator Following Strip Chart Driving Aid During Emission Test

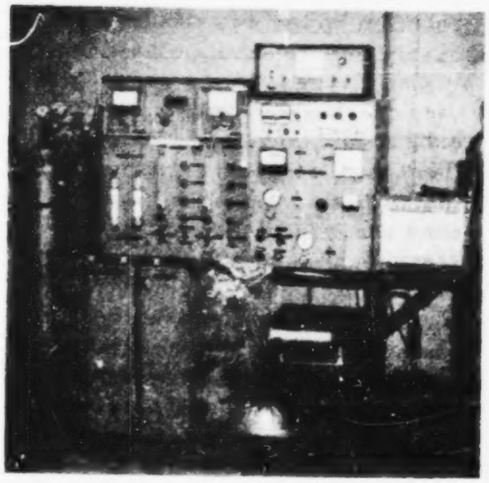


Figure 5. Instrument Cart Used for Analysis of Bag Samples

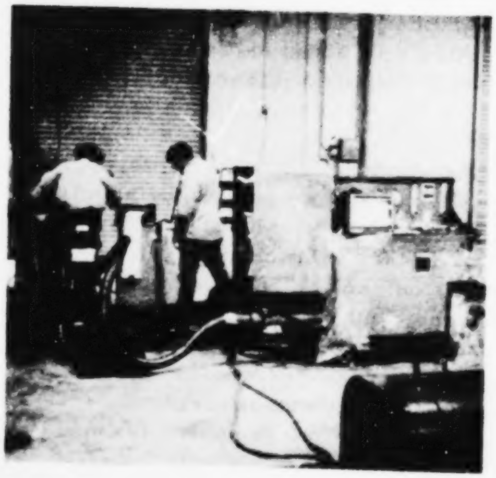


Figure 6. Constant Volume Sampler Connected to Honda SL100 Motorcycle During LA-4 Emissions Test

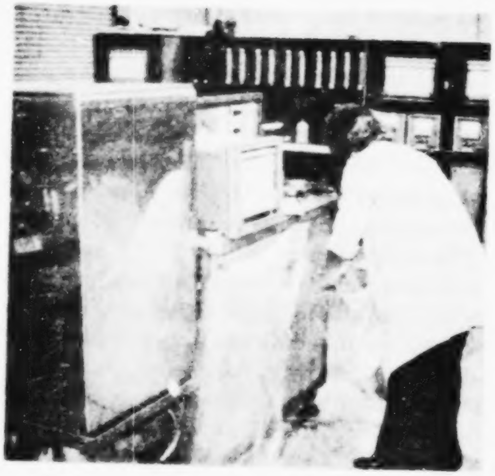


Figure 7. Technician Removing Dilute Sample Bags from Constant Volume Sampler

only exceptions made to the 1975 procedures were that only one background bag was taken during each phase (rather than two), and that the humidity correction factor was assumed to be 1.0 in all cases. The exceptions probably did not have a significant effect on the overall results.

The major difference in calculation procedure between the 1972 and 1975 versions of the Federal light-duty vehicle test procedure is the inclusion of emissions measured during the transient hot phase (bag 3, as noted in the Appendix) in the latter procedure. This change tends to reduce the importance of the cold start to some extent, but since motorcycles warm up rapidly (they have air-cooled engines which are not as bulky as automobile engines) the change probably means little as far as motorcycle emissions are concerned. Both the 1972 and 1975 procedures make use of the same basic principles of measurement, namely; dilution of sample to slow down reactions and prevent condensation of water; determination of volume concentrations of the time-averaged dilute sample; and use of the concentrations with total diluted exhaust volume flowrate to determine mass emitted per mile. This procedure contrasts sharply with the older 7-mode calculations, which required calculation of an "average" concentration based on defined intervals within the cycle, and use of an empirical exhaust volume flowrate to determine mass emitted per mile.

D. Steady State Emissions Measurement Procedures

The inclusion of steady state emissions measurements in addition to the two cyclic procedures was deemed necessary for several reasons. First, the stability of the emissions was of interest, so sampling over a period of time was desirable from that standpoint. In addition, due to the lack of reliable continuous methods for analysis of some exhaust constituents, more or less extended sampling periods were required (aldehydes, light hydrocarbons, and particulate).

Development of reasonable operating conditions for the motorcycles was undertaken with the idea in mind that the resulting procedures should be useful for measurement of gaseous emissions, particulates, and smoke. The dynamometer setup did not include provision for "motoring", or simulation of downhill closed-throttle operation, so the range of operation was limited to level road and uphill conditions. As has already been shown in the discussion on road testing and dynamometer simulation, the dynamometer friction was quite similar to level road resistance, so "road load" conditions were run with no additional power absorption. Uphill conditions were defined in terms of grade, which is normally expressed as a percentage (% grade = 100 X tangent of angle with horizontal). The additional power (above road load) required to overcome a grade is given by

$$\text{Power} = (\text{speed})(\text{weight of machine} + \text{rider}) \sin\left(\arctan \frac{\%\ \text{grade}}{100}\right),$$

and the rider weight is assumed to be 150 lbf. It was decided that each machine should be run over the range of its gradeability in gears reasonable for the speeds and grades involved, but that the motorcycles should not run at their maximum outputs for long periods of time. The latter consideration led to the arbitrary limit on power absorption of 75% of power available over road load at any speed/gear condition. If, for example, a certain motorcycle would maintain 40 mph in 3rd gear while pulling a maximum indicated power over road load of 10 hp, then the maximum power over road load required for any sampling condition would have been 7.5 hp.

The effect of this limitation on power output was that the number of possible conditions was restricted by available power, especially for the smaller motorcycles. In order to "map" the engines somewhat more broadly, additional conditions were added at higher engine speed and relatively high loads. These latter conditions are thought to represent to some extent the type of usage which motorcycles might undergo in the off-road situation rather than the on-road situation. For the five largest motorcycles, the high speed conditions decided upon were 0.6 and 0.8 times maximum rated rpm with road load, one-third of power available over road load, and two-thirds of power available over road load (total of six conditions). The gear chosen for each engine rpm was that which would bring road speed closest to 30 mph for the given engine speed. These conditions were abbreviated "0.6 Max RL", "0.6 Max 1/3", and so forth.

For the two smaller motorcycles, the conditions chosen were 75% of power available over road load at 20 mph, 30 mph, and 40 mph (abbreviated "20H", "30H", and "40H"). Gears chosen in this instance were the lowest (numerical) gears which could be used without exceeding rated rpm. For the Honda SL100, the "5% grade" conditions could not be achieved at 40 mph or 50 mph in 5th gear (considered normal for highway operation), so the grades corresponding to 75% of power available over road load were substituted (3.0% and 2.4%, respectively). The schedule for the Kawasaki 125F-6 was limited even more than that for the small Honda because the Kawasaki would not pull much power in addition to road load in the higher (numerical) gears. The test conditions used for all the motorcycles are given in Appendix D, pages D-2 through D-28, along with the gaseous emissions data developed during the steady-state runs.

1. Gaseous Emissions

The foregoing discussion applies to all the steady-state emissions measurements, but some additional consideration should be given to each type of analysis. The gaseous emissions measured on a continuous basis during steady-state tests included hydrocarbons by NDIR (last 2 bikes only) and total hydrocarbons by FIA; CO, CO_2, and NO by NDIR;

NO and NO_x by chemiluminescence; and O_2 by electrochemical analysis (6 of the 7 motorcycles). Batch samples were taken over a 3-minute period for aldehyde analysis, (MBTH method(4) for RCHO and chromotropic acid method(5) for HCHO), and bag samples were taken concurrently for light hydrocarbon analysis (last 2 motorcycles only). The chromatograph employed for the light hydrocarbon analysis used a 10 ft by 1/8 inch column packed with a mixture of phenyl isocyanate and Porasil C preceded by a 1 inch by 1/8 inch precolumn packed with 100-120 mesh Porapak N.

The majority of the equipment used for steady-state gaseous emissions tests is shown in Figure 8, with most of the continuous analysis instrumentation at left. The oven in the foreground just to the right of the motorcycle operator contains the FIA detector as well as plumbing for the wet chemistry sampling system. The plastic bag at far right is being filled for subsequent gas chromatograph analysis. Figure 9 is a more detailed view of the continuous analysis/readout system, and the insulated containers in the foreground are water traps.

Figure 10 shows the special exhaust systems fabricated for the test motorcycles to prevent leaks and obtain representative exhaust samples. The pipes were welded to the original muffler shells, and were made with fairly large diameter tubing formed into smooth bends (where necessary) to keep backpressure to a minimum. The systems shown were used for LA-4 and 7-mode tests as well as steady-state tests.

2. Particulate Emissions

The contract under which the subject work was performed calls for measurement of exhaust particulate by "isokinetic sampling probes for either glass fiber filtration or an equivalent level of measurement effort as specified by the Project Officer." The problem with this requirement at the time the project began was that neither a "standard" method for particulate measurements on mobile sources nor a good definition of "particulate" was available. In effect, a certain amount of latitude in particulate measurement was granted to the contractor by default, so an original system was designed to meet project objectives. This system withdrew exhaust "isokinetically" through a probe of 0.305 inch inside diameter, diluted it with a larger flow of prepurified dry (compressed) air, and then filtered the dilute mixture. The term "isokinetic" is qualified because the best that could be hoped for was to match the bulk flow velocity in the exhaust pipe at the probe tip, rather than the instantaneous velocity.

Total exhaust sample flow was obtained by subtracting the known dilution air flow (metered through a critical orifice) from the total flow of dilute mixture (measured by a positive-displacement dry gas meter). Particulate weight was obtained by subtracting the filter's original weight from its weight after sampling. As required by the constraints of the

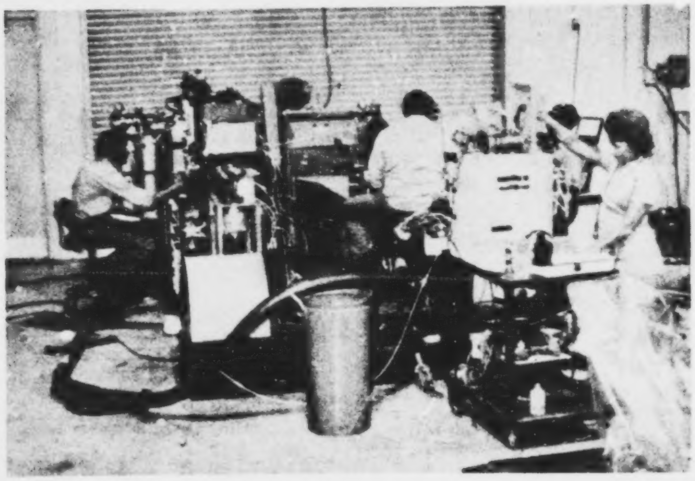


Figure 8. Overall View of Gaseous Emissions Analysis System Used for Steady-State Motorcycle Tests

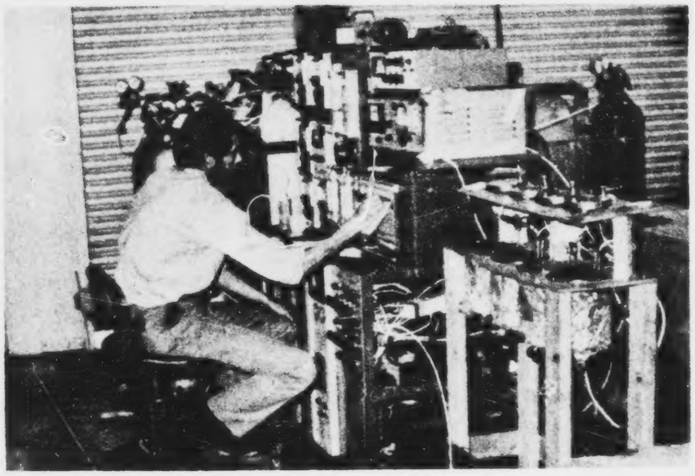
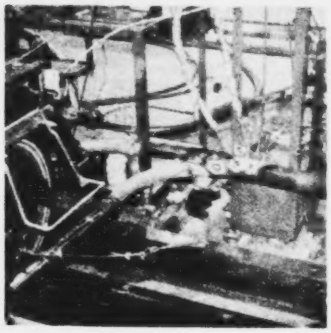
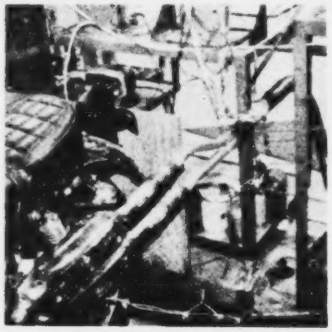


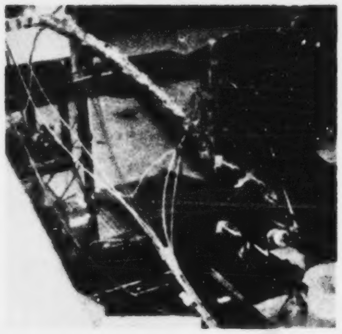
Figure 9. Detailed View of Continuous Analysis/Readout System Used for Steady-State Motorcycle Tests



10A. Harley-Davidson FLH

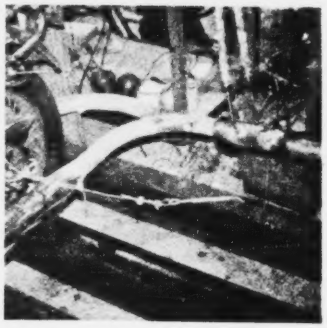


10B. Honda CL350K3

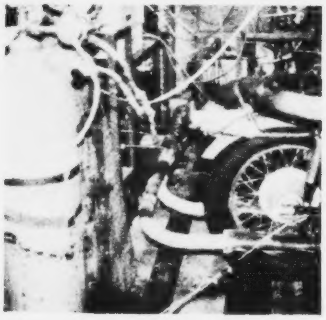


10C. Honda SL100

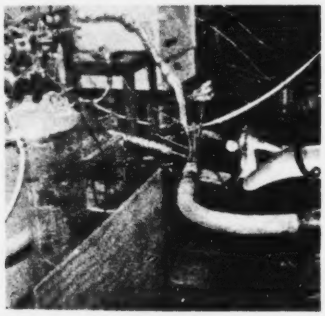
10D. Kawasaki 125F-6



10E. Suzuki T250



10F. Triumph T120R



10G. Yamaha DT1-E

Figure 10. Configuration of Special Exhaust Systems
Used for Motorcycle Gaseous Emissions Tests

sampling system, then, "particulate" was defined for the purposes of this project as everything which was retained at 85 ± 5° F on a filter having 0.45 micron mean flow pore size, exclusive of water and particles obviously not combustion-derived (metal bits, etc.). The extremes in temperature at the filter were 77° F and 92° F, with only some 15 readings of about 200 being outside the 80° F-90° F range.

Particulate was measured during some of the same steady-state conditions which have already been described. Conditions during which samples were taken for all the motorcycles included idle and the four "road load" conditions. Samples were also taken during two of the high load conditions on the Honda SL100 and Kawasaki 125F-6, during the four "10% grade" conditions for the other five machines, and during two of the "20% grade" conditions (in addition) for the Yamaha DT1-E. Most of the samples were taken over a 5-minute period, and each condition was repeated four times or more as necessary to obtain reasonably repeatable results.

Unused filters were kept in a dessicated chamber, and were dried out again following use to establish a stable baseline. The balance used to weigh the filters (nominal weight 500 mg) had an accuracy of ± 0.1 mg over the range of measurements taken, and the instrument "zero" was checked between each two independent weighings. The filters were weighed a minimum of four times both before and after use, and the last two weights had to be within 0.2 mg of each other. The last two weights were averaged to obtain the values used in computations. During the sampling period, temperatures and pressures were recorded throughout the system, permitting calculation of exhaust flow rate to 3 significant figures.

The particulate sampler is shown in Figures 11 through 13 with Figure 11 being an overall view showing the dilution air cylinder at left, readouts and controls on the top shelf and back panel, filter holder at back right of the top shelf and pump and dry gas meter on the second and third shelves, respectively. Figure 12 shows more detail of the readouts and controls, with critical flow element upstream pressure gauge at left, rate-setting flowmeters at center, temperature readouts at lower left and gas volume counter, pressure gauges, and timer on the back panel. Figure 13 shows a back view of the sampler as attached to the Kawasaki 125F-6 motorcycle, with heated exhaust and sample lines necessary to prevent condensation of water prior to entering the sampler.

3. Smoke Emissions (2-stroke machines only)

This section on smoke emissions is included under the steady-state measurements heading as a matter of convenience, and not because

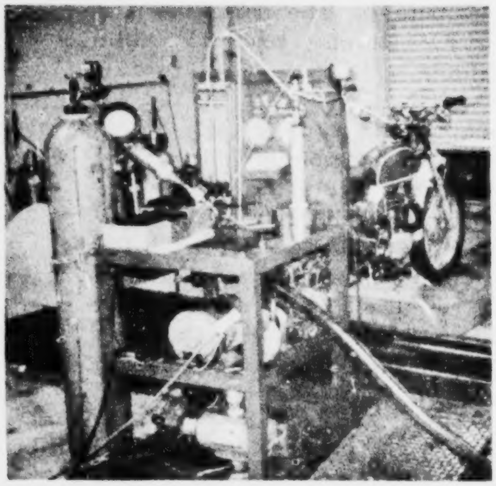


Figure 11. Overall Front View of Particulate Sampler Used for Motorcycle Tests

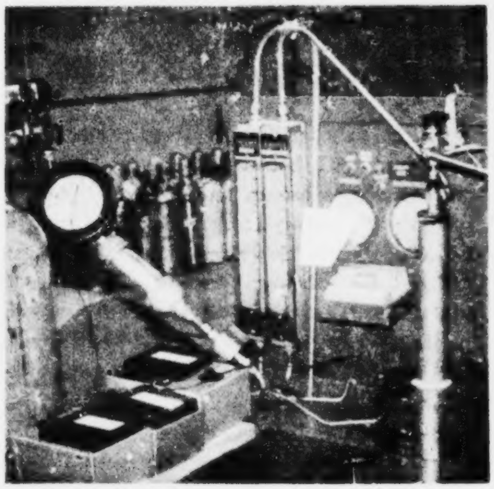


Figure 12. Detail View of Controls and Readouts Used on Particulate Sampler

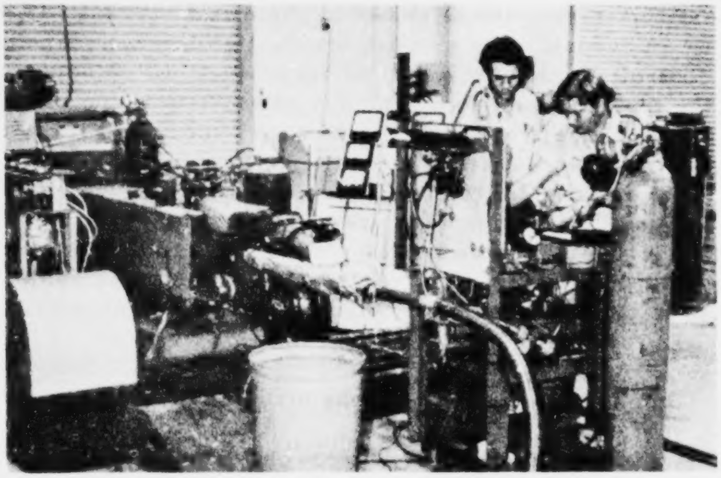


Figure 13. Rear View of Particulate Sampler Set Up for Tests on Kawasaki 125F-6

the smoke measurements were taken during steady-state conditions. The fact is that the smoke tests were conducted by continuous monitoring of smoke opacity on a strip-chart recorder while the motorcycles were being operated over the first 505 seconds of the "LA-4" route. The rationale for this decision was that smoke *as seen by the public* should be the basis for evaluating the machines, so the LA-4 was adopted as being representative for the purposes of this project.

Actual measurement of the smoke opacity was performed by attaching a PHS full-flow light-extinction smokemeter to the end of a straight section of tailpipe. Figures 14 and 15 are two views of the setup as used on the Kawasaki 125F-6, which was similar to that used for the Yamaha DT1-E. The Suzuki T250 used a slightly different system since it had twin exhausts, and the collector pipe was 3 inches in diameter rather than the 2 inches used for the single-cylinder machines. This difference in diameters means that the opacity readings for the Suzuki are based on a longer optical path length and are therefore not directly comparable to those for the other two machines.

It should also be noted that the PHS smokemeter was used as a research tool only on the motorcycle smoke, not because it is recommended for such use. It probably gives reasonably accurate results on "white" smoke, but some research into the matter would be necessary before it could be recommended as a rigorous quantitative technique.

E. Special Study on Crankcase or "Blowby" Emissions from One 4-Stroke Machine

At the time when the first attempt was made to estimate the national impact of motorcycle emissions under the subject contract(6), one area in which data were totally lacking was crankcase "blowby" emissions. The assumptions were made that only hydrocarbons were emitted from the vent (other than air), and that they amounted to 20% of the exhaust hydrocarbons. This latter figure was developed during studies on automobiles some time ago(7, 8), and it was the best-supported generalization available.

When tests began on the two smaller motorcycles, it was determined that blowby should be investigated from the four-stroke machine in a limited way. This special study was conducted using several complementary measurement techniques, including bag sampling of the blowby gases with subsequent analysis on an instrumentation system designed for low concentrations; continuous sampling with analysis by the same instrumentation used for steady-state exhaust samples; and rerouting the blowby gases into the air cleaner to simulate a "controlled" system with "before and after" measurement of exhaust concentrations. In order to permit computation of blowby emissions on a mass basis, blowby

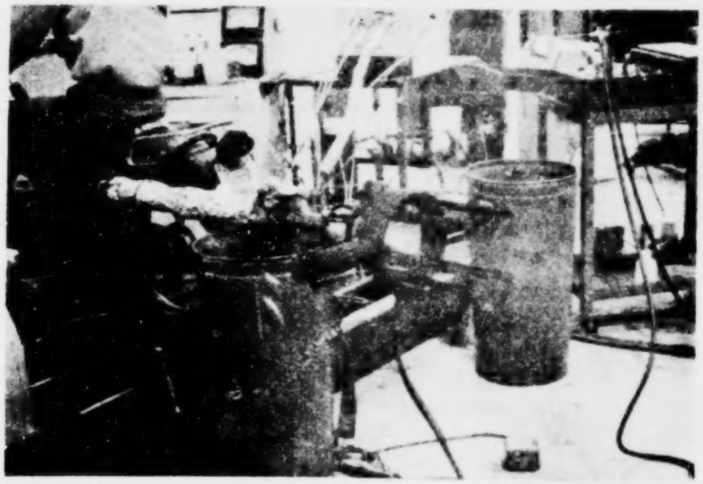


Figure 14. First View of Smoke Measurements Being Taken on Kawasaki 125F-6 Motorcycle

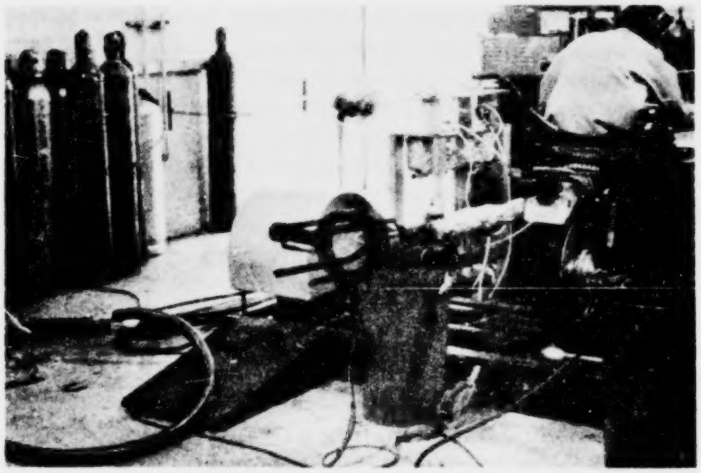


Figure 15. Second View of Smoke Measurements Being Taken on Kawasaki 125F-6 Motorcycle

rate was measured using a wet test meter. To avoid using an inordinate amount of time on this sub-study, sampling was limited to just 3 conditions; idle, 20 mph road load, and 40 mph road load. Figure 16 shows a bag sample being taken during an idle condition and Figure 17 shows the motorcycle set up for continuous sampling. In the latter configuration, the sample line ran up behind the saddle to a tee, one side of which went to the analyzers and the other to the bag at lower right. The sample rate was adjusted so that the bag filled very slowly, providing another check on the backpressure being exerted against the blowby gases in addition to the gauge near the fuel tank which teed into the sample line at the end of the standard vent hose. Data taken during the crankcase emissions study will be presented in section IV. A. 4.

F. Estimation of Unmeasured Emissions

The subject contract was limited by time and financial constraints to measurement of those emissions which were considered most significant and for which reliable techniques were available. According to these criteria, it was decided to estimate emissions of sulfur oxides (SO_x) and evaporative hydrocarbons rather than attempt to measure them.

1. Evaporative Losses of Hydrocarbons

Evaporative losses of hydrocarbons for which motorcycles are responsible include spillage during fueling operations (including mixing of oil and gasoline for 2-stroke machines which do not have injection pumps), losses from the fuel tank and carburetor while running, and losses from the fuel tank and carburetor while the machine is parked. Spillage losses are simply not within the scope of this contract, but other investigations (not specifically on motorcycles) are filling this need. Running losses from the fuel tank and carburetor are quite possibly significant, but no information is available from which they can be estimated intelligently. Evaporation while the machine is not in use is the only category of evaporative loss which can be estimated using available data, so all further discussion here will concern this type of loss alone.

Losses from the carburetor during the cool-down period of an automobile (called the "hot soak") are quite high because the engine is enclosed and has a large heat capacity, and because the carburetor sits on top of the engine. None of these three conditions holds for motorcycles, however, since their carburetors are side-draft and mounted behind the engine, and since the engine is much smaller and less enclosed. Carburetor hot-soak losses are therefore probably small, and the rather small float chambers mean that diurnal breathing losses from the carburetor can probably be neglected, also. Elimination of the other evaporation processes, then, has left diurnal loss from the fuel tank

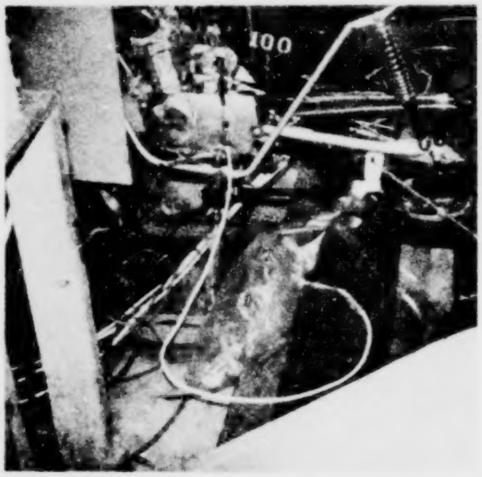


Figure 16. Bag Sample of Blowby Gases Being Taken from Honda SL100 at Idle

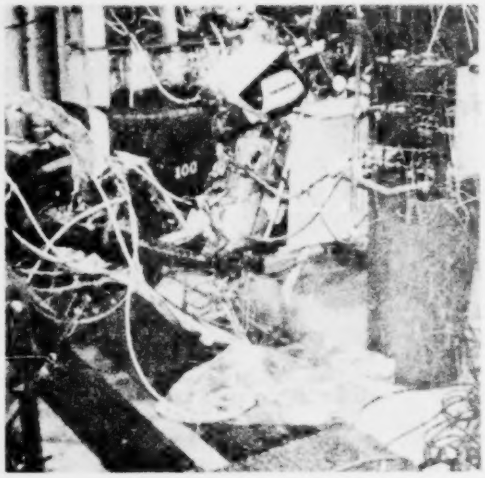


Figure 17. Overflow Bag and Other Parts of Continuous Blowby Analysis System Used on Honda SL100

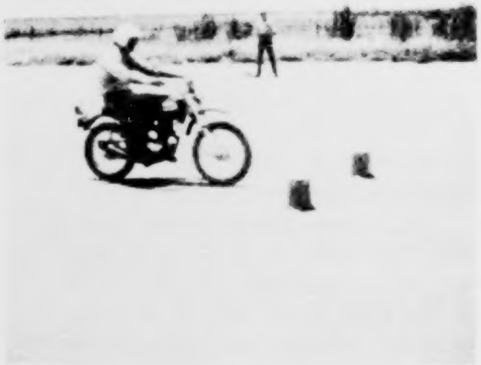


Figure 18. Noise Measurement on Honda SL100 Motorcycle From Side 1 During Right-to-Left Acceleration Run

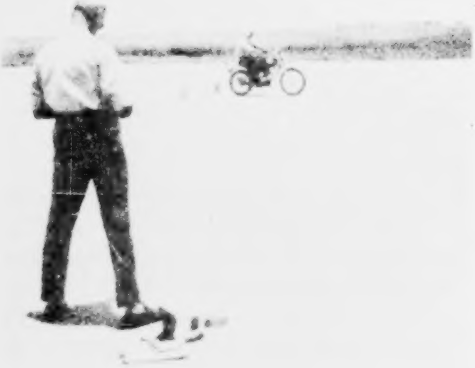


Figure 19. Noise Measurement on Honda SL100 Motorcycle from Side 1 During Left-to-Right Acceleration Run

as the only significant evaporation loss which can be estimated from reasonable assumptions.

Diurnal breathing losses are primarily functions of fuel vapor pressure, vapor space in the tank, and the diurnal temperature swing. The standard low and high temperatures for evaporation loss measurements have been pretty well established at 60° F and 84° F, respectively, and several studies have been conducted to determine the effects of fuel Reid vapor pressure (Rvp) and other variables. Reasonably accurate estimates of diurnal losses can be made by assuming a typical Rvp for the fuel and dividing the numbers developed for cars at that Rvp by the applicable ratio of fuel tank volumes. For example, if 30 g/day tank hydrocarbon loss were determined to be representative for a car with a 15 gallon tank, the comparable value for a motorcycle with a 2.5 gallon tank would be (30)/(15/2.5) g/day or 5 g/day if Rvp and the temperature extremes were held constant. Based on the results of investigations directed specifically toward evaporation(9, 10) and the assumption that a summer fuel Rvp of 9.0 psi is typical(11), the factor to be used for motorcycle evaporative emissions is (2.0 g hydrocarbons)/(gallon tank volume day). It might also be noted that the nominal average molecular weight of the hydrocarbons evaporated from standard emissions test fuel with an Rvp of 9.0 is about 58 g/g mole(9), which means that the average molecule evaporated is near butane in structure. The evaporative emission factor developed by this analysis must be considered conservative.

In order to arrive at a usable loss per motorcycle, it is necessary to make some assumption on fuel tank volumes for various sizes of motorcycles. To this end, the data given in Table 2 were developed from available statistics. The actual computation of evaporative emissions factors and impact and the discussion on their seasonal and regional variations is deferred until section V, where all the remaining factor and impact calculations will be done.

TABLE 2. NOMINAL FUEL TANK CAPACITIES
FOR VARIOUS SIZES OF MOTORCYCLES

Displacement, cm^3	Nominal Fuel Capacity, gal
under 140	2.0
140 - 199	2.5
200 - 299	3.0
300 - 439	3.2
440 - 699	3.6
700 and over	4.0

2. Oxides of Sulfur (SO_x)

Instrumentation for measurement of sulfur oxides in the exhaust of internal combustion engines has not been developed to the same point as that for other common pollutants, so it has become more or less accepted practice to calculate sulfur oxide emissions based on fuel sulfur content. The assumption is usually made for convenience that all the sulfur oxidizes to SO_2, and thus the mass emission rate of SO_2 is taken to be 2.00 times the rate at which sulfur is entering the engine in the form of fuel (2.00 is the ratio of the molecular weight of SO_2 to the atomic weight of S). This technique is fairly accurate for 4-stroke engines (where substantially all the fuel is being burned), but it should be modified for 2-stroke engines to reflect the fact that a substantial fraction of the fuel is not being burned (that is, some of the fuel sulfur is being emitted without being oxidized). This modification is made by assuming that the fraction of fuel sulfur going to SO_2 is the same as the fraction of the fuel burned, which can be determined from hydrocarbon mass emissions. Emission rates will be calculated and included in section V. based on assumed fuel sulfur contents(11) of 0.043% by weight for the regular fuel used in 2-stroke engines and 0.022% by weight for the premium fuel used in 4-stroke engines.

G. Motorcycle Noise Measurement Procedure

The procedure and instrumentation used for motorcycle noise measurements were basically those specified by SAE Standard J986a(12), although additional measurements not included in J986a were included also. The procedure specifies measurement of peak noise levels during acceleration from 30 mph in the lowest numerical gear such that the vehicle's engine does not overspeed within 50 ft following the onset of the acceleration. This acceleration is intended to be a "worst case" condition, that is, to represent the loudest operation of the vehicle.

In addition to the acceleration test, noise measurements were also taken during a 30 mph constant-speed "driveby" at the same 50 ft distance from the vehicle path, and idle noise was measured all around the motorcycles at a distance of 10 ft. These procedures are documented in Figures 18 through 21, with Figure 18 showing the Honda SL100 leaving the test section after a right-to-left run with measurement on the "first side". Note that the right and left references are from the viewpoint of the person taking the measurements. Figure 19 shows the Honda SL100 entering the test section for a left-to-right run with measure ment on the first side (measurements were taken from both sides of the strip to cancel out directional effects, if present). Figures 20 and 21 show noise measurements being taken at idle on the Kawasaki 125F-6 from the rear and from the left side, respectively (noise measurement at idle is referred to the motorcycle rather than the observer).

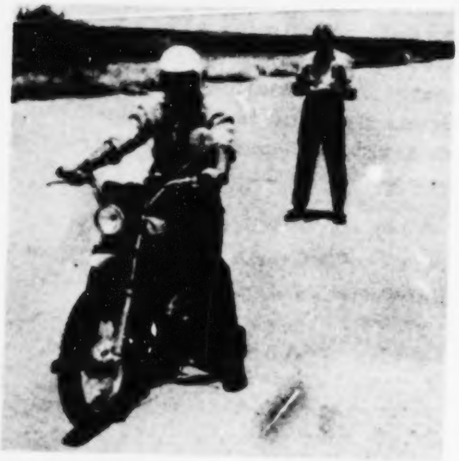


Figure 20. Idle Noise Being Measured from the Rear of the Kawasaki 125F-6 Motorcycle

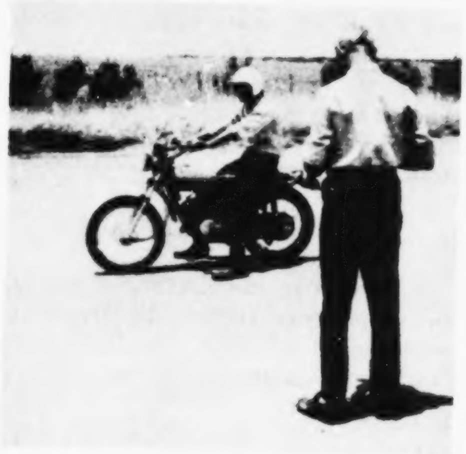


Figure 21. Idle Noise Being Measured from the Left Side of the Kawasaki 125F-6 Motorcycle

The area used for the noise tests was the abandoned airstrip at Hondo, Texas, which the contractor uses on a rental basis as the need arises. The instrumentation used for the tests consisted of a General Radio Type 1565-A sound level meter with windscreen, and a General Radio Type 1562-A sound level calibrator. Ambient noise levels during the tests were in the range of 44 to 48 dbA, and they were also measured on the "C" scale (flat response) as 52 to 74 dbC. The three motorcycles tested were the Honda SL100, the Kawasaki 125F-6, and a privately-owned Yamaha 175 which was included to provide a wider data base. The other motorcycles were not tested for noise because the directive on noise evaluations was added to the contract with the last modification, after the first five motorcycles had been returned to their suppliers.

IV. EMISSIONS TEST RESULTS

The gaseous emissions results which are summarized in this section are given in detail in Appendixes B (7-mode results), C (LA-4 results), and D (steady-state results). Exceptions include results for aldehydes and light hydrocarbons and results of the blowby measurements on one machine, which are presented only in the text. Reproductions of recorder traces showing speed and smoke opacity versus time for the 2-stroke motorcycles operated on the LA-4 route are given in Appendix E. Particulate results are presented in text only.

A. Gaseous Emissions

Due to the variety of tests run on the motorcycles, the gaseous emissions results will be presented in four parts. These parts are 7-mode results, LA-4 results, steady state results, and crankcase or "blowby" results on one motorcycle.

1. Results of 7-Mode Tests

As mentioned earlier, the 7-mode procedure was used for Federal certification of 1970 and 1971 model year light duty vehicles (excluding motorcycles and certain other vehicles). Its primary usefulness in this study is for determining average emission concentrations during transient conditions. The procedure as written$^{(1)}$ includes an empirical equation for exhaust flowrate in ft^3/mile which, it is assumed, was developed from experimental data on automobiles. This equation gives erroneously low values for light vehicles such as motorcycles, so it was not used, and thus the 7-mode results will be reported in concentrations only and not in g/mile. It should be noted that all hydrocarbon concentrations given on the 7-mode printouts (Appendix B) and those given in text are in ppm hexane (ppm C_6), which means they should be multiplied by 6.00 to convert to ppmC if comparison to numbers expressed in that unit is desired. The average test results are presented in Table 3, representing a total of 32 runs on the seven motorcycles. Several features of these data are worthy of note, beginning with the quite reasonable consistency in hydrocarbon concentrations within the 4-stroke group (considering that the Triumph may have had faulty piston rings) and the even better consistency within the 2-stroke group. The perhaps unexpectedly low CO concentrations for the two smallest bikes seem to be due to operation at high rpm for a substantial portion of the cycle, and the high NO concentrations for the same two machines are due to the high average load factor required of the small engines in order to stay up with the speed-time schedule. It can be noted also that hydrocarbon concentrations from the 2-stroke machines were higher than those from the 4-strokes by about a factor of 3, that CO concentrations from the 2-strokes were lower than those from the 4-strokes by about a factor

TABLE 3. SUMMARY OF AVERAGE MOTORCYCLE 7-MODE TRIP COMPOSITE RESULTS

Motorcycle	No. Runs Made	HC, ppm C_6	CO, %	NO (NDIR), ppm
Harley-Davidson FLH	5	1350	8.31	209
Honda CL350K3	6	1330	9.20	164
Honda SL100	3	1520	4.84	711
Kawasaki 125F-6	3	4810	1.67	235
Suzuki T250	5	5940	4.43	90
Triumph T120R	5	2400	9.13	260
Yamaha DT1-E	5	5180	2.92	107

Note: All concentrations on a dry basis

of 2.5, and that NO concentrations from the 2-strokes were lower than those from the 4-strokes by about a factor of 2.3. Care should be taken not to generalize these observations since they stem from such a small sample of machines.

All the concentration data referring to 7-mode tests which are reported in both Appendix B and the text are on a "dry" basis, that is, as measured after the sample had been run through water traps. In terms of effect, measurements on a dry basis are higher than those on a wet basis from perhaps 10 to 20% (carburetted engines only), depending on completeness of combustion and fuel-air ratio.

In order to extract data on concentrations during transients from the computer printouts in Appendix B, it is necessary only to examine the "concentration as measured" columns opposite the particular condition of interest (0-25 mph accel, 30-15 mph decel, 15-30 mph accel, or 50-20 mph decel). Concentrations of CO_2 are included, so the emissions can be converted back to a wet basis, if desired. It should be noted that for research purposes these time-averaged concentrations are really no substitute for continuous recorder traces which actually show concentration as a function of time.

Other data have been developed for a range of motorcycles on the 7-mode procedure(13, 14), and in general the results show reasonable agreement with those of this study. Since the 7-mode results have been included primarily for examination of transients, however, these other data will not be repeated here. As a general conclusion, the 7-mode procedure is much less adaptable to motorcycle testing than the newer "LA-4" procedure.

2. Results of "LA-4" Tests

The procedure called the "LA-4" is so named for the speed-time trace used, which was developed on a driving route called "LA-4" (Los Angeles-4). The main differences between this procedure and the 7-mode are; (1) the LA-4 trace is non-repeating and much more random, containing a number of small accels and decels but very little cruising time, and (2) time-averaged bag samples of diluted exhaust are used to determine mass emissions on the LA-4 rather than mathematical integration of exhaust concentrations during a few parts of the driving schedule. The latter feature, especially, makes the newer procedure quite readily adaptable to testing of a variety of vehicles.

The driving schedule and the type of sampling specified for 1972 procedures and 1975-1976 (and presumably later) procedures are identical, but detail refinements are being made as time progresses. The procedure used for the subject tests is most similar to that currently specified for 1975 certification with minor exceptions as explained in section III. C.

The computer program used to analyze the data gathered in this study printed out results in terms of grams per mile, as shown at the bottom of each table in Appendix C. These data are important to later sections of the report, so they are presented in detail in Table 4. The major features of these data are essentially the same as those already described for the 7-mode data, with the additional variable of exhaust mass flow inherent in the values. From the accuracy standpoint, these LA-4 data are considered to be very good, since there are few opportunities for error in the procedure. Repeatability from run to run for nearly all categories appears to be satisfactory, and the only major deficiency in the data appears to be the size of the sample, which limits analysis for variation in emissions due to engine size and type.

Trends which were perhaps not so obvious in the 7-mode concentration data include a definite size effect on emissions of hydrocarbons and CO (larger machines emitting larger amounts), but a reversal of the downward trend in NO_x from larger to smaller machines somewhere above the 100 to 125cc class represented by the two smallest motorcycles tested. The only available earlier NO_x data(13) simply are not reasonable, but some information obtained from Yamaha Motor Co.(15) on NO_x emissions from 4-stroke motorcycles indicate the same overall trends as data taken in the subject study. The NO_x data from Yamaha are shown in Table 5, and they agree quite well in nominal levels with those taken in the subject study as well as in trends, but it is not known how many individual motorcycles or tests the Yamaha data represent.

The reason for higher NO_x from small motorcycles is probably that they must operate at higher engine speeds and loads than larger machines in order to stay with the speed-time trace. Support for this assertion

TABLE 4. SUMMARY OF RESULTS OF FEDERAL LIGHT-DUTY VEHICLE EMISSIONS TEST PROCEDURE FOR 1972 AND BEYOND AS APPLIED TO MOTORCYCLES

Motorcycle	Run	HC, g/mi	CO, g/mi	NO_x as NO_2, g/mi	Fuel Usage mi/gal
Harley-Davidson FLH	1	4.86	70.6	0.128	-
	2	5.86	80.2	0.120	-
	3	5.92	79.9	0.127	-
	Average	5.55	76.9	0.125	24
Honda CL350K3	1	3.86	46.2	0.0643	-
	2	4.09	45.7	0.0494	-
	3	4.17	47.6	0.0432	-
	Average	4.04	46.5	0.0523	38
Honda SL100	1	2.17	27.3	0.322	-
	4	1.58	15.5	0.384	-
	5	2.26	25.8	0.265	-
	6	2.13	19.8	0.353	-
	Average	2.04	22.1	0.331	80
Kawasaki 125F-6	1	12.5	6.76	0.194	-
	3	8.87	8.43	0.149	-
	4	8.84	8.22	0.154	-
	5	8.91	7.48	0.154	-
	Average	9.78	7.72	0.163	68
Suzuki T250	2	18.7	34.0	0.0364	-
	3	19.7	29.3	0.0334	-
	4	23.7	41.0	0.0441	-
	Average	20.7	34.8	0.0380	33
Triumph T120R	1	5.36	46.3	0.101	-
	2	5.33	46.5	0.104	-
	3	5.57	45.5	0.117	-
	Average	5.42	46.1	0.107	34
Yamaha DT1-E	3	16.9	28.5	0.0419	-
	4	17.1	27.8	0.0339	-
	5	15.5	22.5	0.0577	-
	Average	16.5	26.3	0.0445	45

TABLE 5. DATA ON NO_x EMISSIONS FROM 4-STROKE MOTORCYCLES SUPPLIED BY YAMAHA MOTOR CO.

	NO_x Emissions	
Displacement, cm^3	g/Km (as supplied)	g/mi (converted)
50	0.33	0.53
125	0.20	0.32
250	0.08	0.13
350	0.06	0.10
500	0.10	0.16
650	0.08	0.13

comes from examination of NO_x data at road load conditions in Tables 6 through 12, where the small machines show a very rapid increase in NO_x with speed and the larger machines show relatively small increases. The higher overall mass rates for the small bikes are confirmed by the steady-state data, also.

The other strong trends appearing in the LA-4 data are considerably higher hydrocarbons for the 2-strokes tested than for the 4-strokes, due to short-circuiting of unburned fuel-air mixture, and slightly lower CO and NO_x for the 2-strokes than for the 4-strokes. The reason for the difference in CO is not clear at this point, but at least part of the difference in NO_x is probably due to dilution of the intake charge by exhaust gas (a form of EGR, or exhaust gas recirculation). To really tie down variation in emissions due to engine size and type, however, a much larger data base would be required.

3. Results of Steady-State Tests

The steady-state gaseous emissions tests were by far the most exhaustive of the three types of tests performed, and they generated an extremely broad spectrum of data. The complete raw data are given in Appendix D, (except those on aldehydes and light hydrocarbons), and they are summarized in more useful form in Tables 6 through 12. For the five largest machines, aldehydes have been calculated in mass units only for those modes which will be used to make up a composite "cycle" for use in developing emission factors.

The mode-by-mode data can be used to "map" emissions from each engine to some extent for research purposes, but such an analysis is really beyond the intended scope of the present effort. A more compact way of analyzing some of the constant-speed data is shown in Figure 22, which consists of "envelopes" for the major emissions. The highest and lowest values at each speed have been plotted separately for 2-strokes and 4-strokes, forming the outlines shown. A greater number of motor-

TABLE 6. SUMMARY OF CONSTANT-SPEED GASEOUS EMISSIONS DATA FOR THE HARLEY-DAVIDSON FLH MOTORCYCLE, AVERAGE VALUES FOR 3 RUNS*

			Mass Emissions, g/hr				Mass Emissions, g/mi				Concentration	
Mode	Condition	Speed mi/hr	HC	CO	NO_x as NO_2	RCHO as HCHO	HC	CO	NO_x as NO_2	RCHO as HCHO	HCHO, ppm	RCHO, ppm
1	Idle	-	136	1190	1.59	1.32	-	-	-	-	26	59
2	20 RL	20	193	3540	3.26	3.24	9.64	177.0	0.16	0.16	47	71
3	30 RL	30	181	3860	3.41	4.45	6.02	129.0	0.11	0.15	55	92
4	40 RL	40	159	3850	3.32	3.40	3.97	96.3	0.08	0.08	46	75
5	50 RL	50	123	3940	4.91	2.76	2.47	78.7	0.10	0.06	38	56
6	20 5%	20	135	4490	4.51	-	6.76	224.0	0.23	-	34	49
7	30 5%	30	91	3660	5.33	-	3.02	122.0	0.18	-	21	34
8	40 5%	40	85	3480	7.77	-	2.13	87.1	0.19	-	13	24
9	50 5%	50	73	2200	14.1	-	1.46	44.1	0.28	-	15	26
10	20 10%	20	121	3790	6.01	2.11	6.06	189.0	0.30	0.10	22	39
11	30 10%	30	67	2570	12.7	1.51	2.25	85.6	0.42	0.05	13	28
12	40 10%	40	46	428	117.	2.10	1.14	10.7	2.92	0.05	18	35
13	50 10%	50	94	4070	22.5	2.20	1.89	81.4	0.45	0.04	16	31
14	20 20%	20	75	2330	23.1	-	3.73	116.0	1.15	-	18	34
15	30 20%	30	99	4010	34.2	-	3.31	134.0	1.14	-	15	32
16	0.6MaxRL	23	211	4300	3.75	-	7.02	144.0	0.12	-	35	65
17	0.6Max1/3	23	84	2250	58.4	-	2.79	74.9	1.95	-	33	59
18	0.6Max2/3	23	203	9590	32.5	-	6.76	320.0	1.08	-	40	64
19	0.8MaxRL	30	93	3900	9.07	-	3.33	110.0	0.32	-	19	33
20	0.8Max1/3	30	199	7630	21.2	-	7.10	273.0	0.76	-	19	35
21	0.8Max2/3	30	306	16300	32.8	-	10.9	581.0	1.17	-	14	32
22	Idle		210	1530	0.81	3.08	-	-	-	-	58	150

*2 runs for aldehydes.

TABLE 7. SUMMARY OF CONSTANT-SPEED GASEOUS EMISSIONS DATA FOR THE HONDA CL350K3 MOTORCYCLE, AVERAGE VALUES FOR 2 RUNS

			Mass Emissions, g/hr				Mass Emissions g/mi				Concentration	
Mode	Condition	Speed mi/hr	HC	CO	NO_x as NO2	RCHOas HCHO	HC	CO	NO_x as NO_2	RCHOas HCHO	HCHO, ppm	RCHO, ppm
1	Idle	-	19	211	0.48	0.49	-	-	-	-	31	61
2	20 RL	20	78	1300	1.30	0.98	3.89	65.3	0.07	0.05	29	57
3	30 RL	30	235	2400	1.45	3.45	7.84	80.0	0.05	0.12	64	134
4	40 RL	40	222	2920	2.11	4.86	5.54	73.0	0.05	0.12	64	162
5	50 RL	50	173	2930	4.17	4.77	3.45	58.6	0.08	0.10	86	149
6	20 5%	20	115	2640	1.48	-	5.74	132.0	0.07	-	40	82
7	30 5%	30	129	3500	3.01	-	4.30	117.0	0.10	-	56	109
8	40 5%	40	146	4420	5.59	-	3.65	110.0	0.14	-	34	78
9	50 5%	50	146	4600	26.3	-	2.92	92.0	0.53	-	32	68
10	20 10%	20	123	3690	3.24	1.98	6.16	185.0	0.16	0.10	32	63
11	30 10%	30	135	5630	4.83	2.74	4.49	188.0	0.16	0.09	32	67
12	40 10%	40	162	5160	11.4	3.81	4.05	129.0	0.28	0.10	37	71
13	50 10%	50	186	5900	20.9	3.86	3.72	118.0	0.42	0.08	34	63
14	20 20%	20	204	5020	5.82	-	10.2	251.0	0.29	-	31	67
15	30 20%	30	226	6100	4.59	-	7.54	203.0	0.15	-	37	74
16	0.6MaxRL	30	288	4270	2.46	-	9.59	142.0	0.08	-	47	100
17	0.6Max1/3	30	192	3910	21.5	-	6.40	130.0	0.72	-	64	115
18	0.6Max2/3	30	157	3160	79.3	-	5.24	105.0	2.64	-	45	91
19	0.8MaxRL	28	396	4080	3.71	-	14.2	146.0	0.13	-	75	142
20	0.8Max1/3	28	265	5120	28.6	-	9.47	183.0	1.02	-	78	138
21	0.8Max2/3	28	280	7200	44.3	-	9.99	257.0	1.58	-	59	109
22	Idle	-	14	279	0.73	0.52	-	-	-	-	31	60

TABLE 8. SUMMARY OF CONSTANT-SPEED GASEOUS EMISSIONS DATA FOR THE HONDA SL100 MOTORCYCLE, AVERAGE VALUES FOR 8 RUNS*

			Mass Emissions, g/hr				Mass Emissions, g/mi				Concentration	
Mode	Condition	Speed, mi/hr	HC	CO	NO_x as NO_2	RCHO as HCHO	HC	CO	NO_x as NO_2	RCHO as HCHO	HCHO, ppm	RCHO, ppm
1	Idle	--	23.2	259	0.17	0.16	--	--	--	--	47	53
2	20 RL	20	36.4	674	1.57	0.34	1.82	33.7	0.078	0.017	26	37
3	30 RL	30	33.5	546	6.18	0.67	1.12	18.2	0.206	0.022	35	55
4	40 RL	40	46.8	713	15.3	0.80	1.17	17.8	0.383	0.020	30	48
5	50 RL	50	64.8	576	50.2	1.22	1.30	11.5	1.00	0.024	33	55
6	Idle	--	21.0	273	0.20	--	--	--	--	--	--	--
7	20 5%	20	37.9	609	16.9	1.08	1.89	30.4	0.843	0.054	45	77
8	30 5%	30	52.2	1004	25.3	1.01	1.74	33.5	0.845	0.034	30	49
9	40 3.0%	40	56.4	1069	25.7	1.06	1.41	26.7	0.643	0.026	39	49
10	50 2.4%	50	77.0	1276	46.5	1.38	1.54	25.5	0.930	0.028	29	49
11	Idle	--	16.3	287	0.22	0.18	--	--	--	--	34	56
12	20 H	20	41.7	788	19.4	0.83	2.08	39.4	0.970	0.042	22	46
13	30 H	30	61.5	1219	32.9	1.38	2.05	40.6	1.10	0.046	30	56
14	40 H	40	78.5	1150	40.8	1.97	1.96	28.8	1.02	0.049	44	73
15	Idle	--	17.0	280	0.21	--	--	--	--	--	--	--

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* 4 runs for aldehydes.

TABLE 9. SUMMARY OF CONSTANT-SPEED GASEOUS EMISSIONS DATA FOR THE KAWASAKI 125F-6 MOTORCYCLE, AVERAGE VALUES FOR 5 RUNS*

Mode	Conditions		Speed, mi/hr	Mass Emissions, g/hr				Mass Emissions, g/mi				Concentration	
				HC	CO	NO_x as NO_2	RCHOas HCHO	HC	CO	NO_x as NO_2	RCHOas HCHO	HCHO, ppm	RCHO, ppm
1	Idle		--	100	88	0.034	0.49	--	--	--	--	123	175
2	20	RL	20	171	78	0.054	1.71	8.55	3.90	0.027	0.086	103	155
3	30	RL	30	185	200	1.25	2.21	6.17	6.67	0.042	0.074	110	156
4	40	RL	40	364	500	4.48	3.09	9.10	12.5	0.112	0.077	84	148
5	50	RL	50	863	646	28.8	7.71	17.3	12.9	0.577	0.15	142	220
6	Idle		--	106	100	0.066	0.56	--	--	--	--	116	210
7	20	5%	20	507	431	20.4	4.31	25.3	21.6	1.02	0.22	118	195
8	20	H	20	980	768	34.9	6.47	49.0	38.4	1.74	0.32	97	176
9	30	H	30	1612	1492	23.0	9.64	53.7	49.7	0.767	0.32	107	190
10	40	H	40	1640	1588	19.9	8.40	41.0	39.7	0.498	0.21	86	167
11	Idle		--	104	100	0.061	0.57	--	--	--	--	120	213

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* 3 runs for aldehydes.

TABLE 10. SUMMARY OF CONSTANT-SPEED GASEOUS EMISSIONS DATA FOR THE SUZUKI T250 MOTORCYCLE, AVERAGE VALUES FOR 4 RUNS*

			Mass Emissions, g/hr				Mass Emissions, g/mi				Concentration	
Mode	Condition	Speed mi/hr	HC	CO	NO_x as NO_2	RCHOas HCHO	HC	CO	NO_x as NO_2	RCHOas HCHO	HCHO, ppm	RCHO, ppm
1	Idle	-	166	95	0.05	0.60	-	-	-	-	38	125
2	20 RL	20	374	263	0.40	2.24	18.7	13.2	0.020	0.11	48	147
3	30 RL	30	379	510	0.76	2.80	12.6	17.0	0.025	0.09	56	154
4	40 RL	40	478	947	1.08	4.09	11.9	23.7	0.027	0.10	57	165
5	50 RL	50	810	1690	2.16	5.73	16.2	33.8	0.043	0.12	53	132
6	20 5%	20	375	433	0.87	-	18.7	21.6	0.044	-	55	141
7	30 5%	30	522	1030	1.33	-	17.4	34.3	0.044	-	48	123
8	40 5%	40	748	1760	2.01	-	18.7	44.0	0.050	-	42	96
9	50 5%	50	982	2420	1.70	-	19.6	58.3	0.034	-	46	119
10	20 10%	20	524	682	1.36	2.25	26.2	34.1	0.068	0.11	48	96
11	30 10%	30	922	1850	2.26	3.33	30.7	61.8	0.075	0.11	44	87
12	40 10%	40	1540	2820	2.49	5.10	38.6	70.5	0.062	0.13	39	94
13	50 10%	50	1790	3370	3.38	6.02	35.8	67.3	0.068	0.12	52	96
14	20 20%	20	1270	1900	2.12	-	63.2	94.8	0.106	-	45	119
15	30 20%	30	1630	3000	1.96	-	54.5	100.0	0.065	-	44	96
16	0.6MaxRL	28	341	554	0.64	-	12.0	19.4	0.022	-	98	208
17	0.6Max1/3	28	1360	3200	2.18	-	57.8	112.0	0.077	-	74	167
18	0.6Max2/3	28	3240	5540	2.84	-	114.0	194.0	0.100	-	54	138
19	0.8MaxRL	24	231	467	0.53	-	9.4	19.1	0.022	-	84	178
20	0.8Max1/3	24	1560	4420	3.15	-	63.7	181.0	0.129	-	66	150
21	0.8Max2/3	24	4030	6320	12.00	-	164.0	258.0	0.592	-	58	171
22	Idle		160	117	0.06	0.76	-	-	-	-	68	163

*2 runs for aldehydes.

TABLE 11. SUMMARY OF CONSTANT-SPEED GASEOUS EMISSIONS DATA FOR THE TRIUMPH T120R MOTORCYCLE, AVERAGE VALUES FOR 3 RUNS*

			Mass Emissions, g/hr				Mass Emissions, g/mi				Concentration	
Mode	Condition	Speed mi/hr	HC	CO	NO_x as NO_2	RCHOas HCHO	HC	CO	NO_x as NO_2	RCHOas HCHO	HCHO, ppm	RCHO, ppm
1	Idle	-	224	799	0.20	0.98	-	-	-	-	34	104
2	20 RL	20	150	2480	0.49	1.45	7.51	124.0	0.02	0.07	42	95
3	30 RL	30	271	2170	2.01	2.37	9.04	71.2	0.07	0.08	44	104
4	40 RL	40	209	2350	2.24	2.33	5.22	58.7	0.06	0.06	43	94
5	50 RL	50	173	2850	4.18	2.31	3.45	57.1	0.08	0.05	36	72
6	20 5%	20	73	1850	4.07	-	3.67	92.6	0.20	-	25	55
7	30 5%	30	100	2620	5.41	-	3.35	87.2	0.18	-	23	49
8	40 5%	40	81	2680	17.90	-	2.03	67.1	0.44	-	26	51
9	50 5%	50	94	2590	43.00	-	1.88	51.8	0.86	-	32	51
10	20 10%	20	64	1950	8.91	1.05	3.20	97.4	0.44	0.05	21	43
11	30 10%	30	78	2910	14.10	1.38	2.60	97.1	0.47	0.05	19	39
12	40 10%	40	77	2520	37.20	1.98	1.92	62.9	0.93	0.05	23	45
13	50 10%	50	85	2220	75.60	1.91	1.69	44.6	1.51	0.04	15	37
14	20 20%	20	58	1960	58.9	-	2.89	97.9	2.94	-	16	39
15	30 20%	30	70	2960	54.6	-	2.34	98.6	1.82	-	21	41
16	0.6MaxRL	-	-	-	-	-	-	-	-	-	-	-
17	0.6Max1/3	-	-	-	-	-	-	-	-	-	-	-
18	0.6Max2/3	-	-	-	-	-	-	-	-	-	-	-
19	0.8MaxRL	-	-	-	-	-	-	-	-	-	-	-
20	0.8Max1/3	-	-	-	-	-	-	-	-	-	-	-
21	0.8Max2/3	-	-	-	-	-	-	-	-	-	-	-
22	Idle	-	238	798	0.22	1.20	-	-	-	-	31	128

*2 runs for aldehydes

TABLE 12. SUMMARY OF CONSTANT-SPEED GASEOUS EMISSIONS DATA FOR THE YAMAHA DT1-E MOTORCYCLE, AVERAGE VALUES FOR 2 RUNS

			Mass Emissions, g/hr				Mass Emissions, g/mi				Concentration	
Mode	Condition	Speed mi/hr	HC	CO	NO_x as NO_2	RCHO as HCHO	HC	CO	NO_x as NO_2	RCHO as HCHO	HCHO, ppm	RCHO, ppm
1	Idle	-	135	137	0.04	0.62	-	-	-	-	35	156
2	20 RL	20	256	144	0.81	2.27	12.8	7.2	0.040	0.11	119	196
3	30 RL	30	139	428	0.66	2.45	4.6	14.3	0.022	0.08	126	190
4	40 RL	40	188	286	1.92	3.25	4.7	7.2	0.048	0.08	102	171
5	50 RL	50	479	1660	2.67	5.87	9.6	33.3	0.053	0.12	124	195
6	20 5%	20	215	255	1.00	-	10.8	12.8	0.050	-	110	180
7	30 5%	30	334	813	2.14	-	11.1	27.1	0.071	-	98	175
8	40 5%	40	628	2340	3.02	-	15.7	58.4	0.076	-	117	183
9	50 5%	50	905	3000	4.37	-	18.1	60.0	0.087	-	126	200
10	20 10%	20	364	897	1.86	4.24	18.2	44.8	0.093	0.21	119	172
11	30 10%	30	499	1610	2.68	5.[illegible]	16.6	53.7	0.089	0.19	120	179
12	40 10%	40	892	2970	4.12	9.05	22.3	74.3	0.103	0.23	118	196
13	50 10%	50	1310	3340	10.80	12.1	26.2	66.9	0.217	0.24	122	199
14	20 20%	20	603	2220	3.10	-	30.2	111.0	0.155	-	130	195
15	30 20%	30	1130	3260	6.68	-	37.7	109.0	0.223	-	134	201
16	0.6MaxRL	27	191	262	0.72	-	7.1	9.7	0.027	-	123	193
17	0.6Max1/3	27	419	1400	2.39	-	15.5	51.7	0.088	-	106	173
18	0.6Max2/3	27	852	2410	10.30	-	31.6	89.1	0.381	-	123	198
19	0.8MaxRL	29	137	439	1.08	-	4.7	15.1	0.037	-	118	172
20	0.8Max1/3	29	578	2830	4.48	-	19.9	97.6	0.154	-	98	173
21	0.8Max2/3	29	1030	4160	10.30	-	35.6	143.0	0.356	-	124	197
22	Idle	-	129	152	0.04	0.74	-	-	-	-	103	205

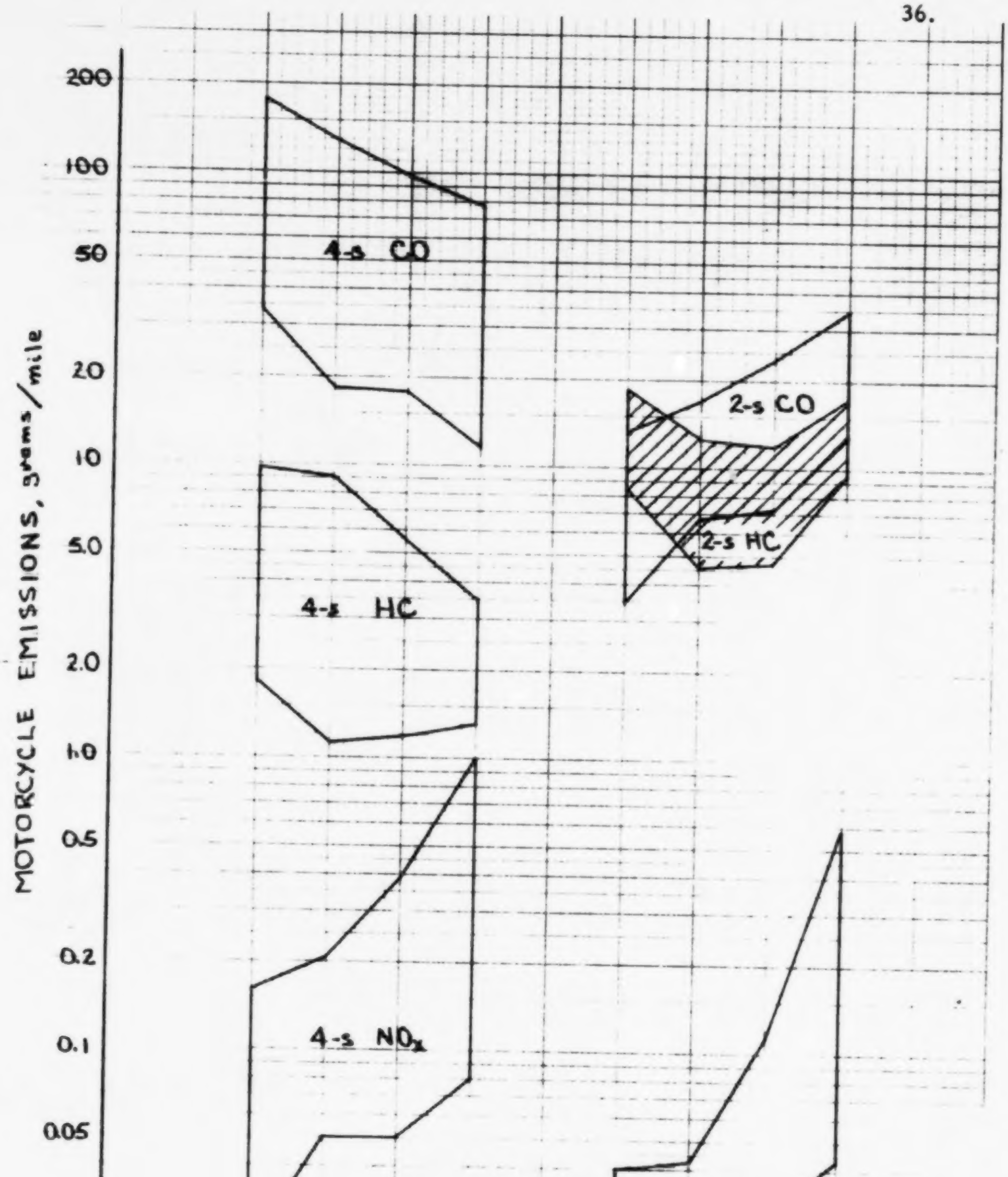

FIGURE 22. ENVELOPES OF ROAD-LOAD EXHAUST EMISSIONS FROM THE SEVEN MOTORCYCLES TESTED (FOUR 4-S AND THREE 2-S)

cycles in each category would doubtless make the ranges even wider (especially the inclusion of larger 2-stroke machines), but even with only a few machines represented, some trends can be observed. Note that although the hydrocarbon and CO envelopes overlap for the 2-stroke machines, the shading of the hydrocarbon envelope prevents ambiguity. The emissions plotted in Figure 22 are those measured during road load conditions only, and while the average emissions from all seven motorcycles do fall within their respective envelopes, all areas of the envelopes should not be construed as having equal weight with respect to the machines tested or the motorcycle population.

To complete the presentation of gaseous emissions concentration data, Table 13 and 14 contain concentrations of light hydrocarbons measured in the exhausts of the Honda SL100 and the Kawasaki 125F-6. Light hydrocarbon data were taken only for these last two machines due to a variety of technical problems encountered when the analysis was attempted earlier on the five larger bikes. Although no comparable data are available on other motorcycles, the concentrations given in Tables 13 and 14 fall into the general ranges which might be expected after examining light hydrocarbon emissions from other engines tested under the subject contract. Propane and butane were omitted from Table 13 because no measurable amount of either compound was found in the exhaust of the Honda SL100.

No attempt will be made to compute light hydrocarbons on a mass basis because the resulting data would be of little significance. Aldehydes, however, are a different matter, since they can be of interest in national impact studies. Aldehydes were measured, of course, only during steady-state conditions, so a method of computing aldehyde mass emissions which approximate those which might be observed during a cyclic procedure like the LA-4 remains to be derived. Individual mode mass emissions of aldehydes are shown in Tables 6 through 12, calculated on the same basis as the other mass emissions, and these mode data can be weighted to make a very rough approximation of a cyclic procedure. The mass data are expressed "as HCHO" (formaldehyde) simply because the assumption of some molecular weight is necessary for calculations and because the importance of the molecule lies in the carbonyl group and not in the remaining structure. The obvious shortcomings of this procedure are that no transients or closed throttle conditions (other than idle) can be included, but emissions on the composite cycles were found to agree fairly well with the LA-4 after some trial-and-error experimentation. Table 15 shows the conditions and weights used in an attempt to simulate road operation. The average speed on both composite cycles is 28 miles per hour, somewhat higher than that for the LA-4 (19.7 mi/hr). Comparison of fuel consumption and hydrocarbon emissions from the composite cycles to the LA-4 (averages) shows fairly good overall agreement, with hydrocarbon emissions a fraction of one percent lower and fuel con-

TABLE 13. DATA ON LIGHT HYDROCARBON EMISSIONS FROM A HONDA SL100 MOTORCYCLE (AVERAGES FOR 3 RUNS)

Mode	Condition	Concentrations of Light Hydrocarbons, ppm				
		CH_4	C_2H_6	C_2H_4	C_2H_2	C_3H_6
1	Idle	1550	57	345	751	164
2	20 RL	440	18	141	156	72
3	30 RL	233	23	115	111	65
4	40 RL	236	22	109	68	71
5	50 RL	221	39	166	49	104
7	20 5%	187	14	85	55	47
8	30 5%	286	19	106	71	59
9	40 3.0%	190	17	93	50	47
10	50 2.4%	289	26	159	72	84
11	20 H	232	26	120	62	78
12	30 H	301	25	137	93	82
13	40 H	352	59	302	205	165
14	Idle	1550	62	336	951	187

TABLE 14. DATA ON LIGHT HYDROCARBON EMISSIONS FROM A KAWASAKI 125F-6 MOTORCYCLE (AVERAGES FOR 3 RUNS)

Mode	Condition	Concentrations of Light Hydrocarbons, ppm						
		CH_4	C_2H_6	C_2H_4	C_3H_8	C_2H_2	C_3H_6	C_4H_{10}
1	Idle	1620	81	446	71	659	143	958
2	20 RL	78	23	97	5	39	41	323
3	30 RL	110	20	87	7	49	51	335
4	40 RL	61	9	71	2	21	41	343
5	50 RL	106	15	76	7	42	63	395
6	Idle	2150	71	556	27	808	126	1010
7	20 5%	127	15	82	6	90	53	441
8	20 H	88	35	82	4	23	65	484
9	30 H	127	13	79	9	40	78	508
10	40 H	160	15	91	6	54	103	714
11	Idle	2470	109	681	21	821	158	1090

TABLE 15. CONDITIONS AND WEIGHTING FACTORS USED FOR CYCLE SIMULATION

Condition	% Time at Condition		Distance (mi)/hr at Condition	
	5 Larger Machines	2 Smaller Machines	5 Larger Machines	2 Smaller Machines
Idle	20	20	0.0	0.0
20 mph - road load	15	20	3.0	4.0
30 mph - road load	15	20	4.5	6.0
40 mph - road load	15	20	6.0	8.0
50 mph - road load	15	20	7.5	10.0
20 mph - r.l.+ 10% grade	5	-	1.0	-
30 mph - r.l.+ 10% grade	5	-	1.5	-
40 mph - r.l.+ 10% grade	5	-	2.0	-
50 mph - r.l.+ 10% grade	5	-	2.5	-
Total = Average Speed =			28 mi/hr	28 mi/hr

sumption about 12% lower on the composite cycles than on the LA-4. This agreement gives a degree of confidence in the data computed over the composite cycles.

Based on the foregoing analysis, composite values for aldehyde emissions from the seven motorcycles have been calculated and are presented in Table 16. Although there is no really accurate way to measure the differences at this point, it appears that aldehyde emissions from 2-strokes are somewhat higher than those from 4-stroke machines of similar size. A weighting procedure similar to the one used for aldehydes will be used later to calculate particulate emissions on a distance-traveled basis.

TABLE 16. CYCLE COMPOSITE ALDEHYDE EMISSIONS FROM MOTORCYCLES

Motorcycle	RCHO as HCHO	
	g/hour	g/mile
Harley-Davidson FLH	2.91	0.104
Honda CL350K3	2.83	0.101
Honda SL100	0.638	0.023
Kawasaki 125F-6	3.04	0.109
Suzuki T250	3.20	0.114
Triumph T120R	1.80	0.064
Yamaha DT1-E	3.76	0.134

4. Results of Special Study on Crankcase "Blowby" Emissions (1 Motorcycle)

The results of the study of blowby emissions (test procedures described in section III. E.) were not surprising, that is, substantial amounts of hydrocarbons were measured, but only negligible amounts of other contaminants. Measurements at the crankcase vent of the Honda SL100 yielded the data shown in Table 17, including both bag samples and continuous samples (no justification could be fonnd for separating the two). These same data expressed on a mass basis are found in Table 18, assuming gas densities as calculated at 29.0 in Hg and 70°F.

TABLE 17. CRANKCASE VENT EMISSIONS FROM A HONDA SL100 MOTORCYCLE (CONCENTRATIONS AS MEASURED)

Condition	Flow ft^3/hr	Run	HC, ppmC	CO, %	CO_2, %	NO, ppm	NO_x, ppm	O_2, %
Idle	4.18	1	42,400	1.24	0.97	5.2	8.8	17.9
	(Avg.)	2	96,500	1.70	0.74	16.5	23.4	16.7
		3	58,400	1.11	1.31	7.4	8.4	18.2
		4	64,500	0.80	1.15	3.8	7.7	18.1
		Avg.	65,400	1.21	1.04	8.2	12.1	17.7
20 RL	7.08	1	60,600	0.96	1.12	8.4	14.2	17.7
		2	85,800	1.32	0.60	10.8	16.8	18.1
		3	76,800	0.86	1.26	9.5	12.9	18.4
		4	47,400	0.63	0.85	14.0	17.8	18.8
		5	68,800	0.95	1.05	4.3	8.0	17.9
		Avg.	69,900	0.94	0.98	9.4	13.9	18.2
40 RL	13.07	1	89,900	0.87	1.15	61.0	71.2	17.3
	(Avg.)	2	80,500	0.50	0.70	22.2	28.3	18.4
		3	80,000	0.20	0.90	43.7	46.7	19.3
		4	77,600	0.25	0.85	36.3	40.2	19.2
		5	59,400	0.30	0.85	29.6	33.8	19.2
		6	57,400	0.22	0.75	26.8	29.7	19.1
		Avg.	60,900	0.39	0.87	36.6	41.6	18.8

In addition to measuring the composition of the blowby gases themselves, measurement of exhaust emissions with and without blowby "recirculation" was also attempted. The results of this sub-study are shown in Table 19, and while they represent independent measurements, they do agree quite well with steady-state exhaust emissions presented in Table 8 and Appendix D. Table 20 summarizes the results given in the preceding parts of this report section, supporting the generalization

TABLE 18. MASS EMISSIONS FROM THE CRANKCASE VENT OF A HONDA SL100 MOTORCYCLE

Condition	Mass Emissions, g/hr			Mass Emissions, g/mi		
	HC	CO	NO_x	HC	CO	NO_x
Idle	4.30	1.61	0.00263	-	-	-
20 RL	7.60	2.47	0.00520	0.380	0.124	0.000260
40 RL	15.5	1.88	0.0292	0.388	0.0469	0.000731
*Composite	10.1	2.06	0.0143	0.421	0.0859	0.000595

*for this purpose only, composite assumed as 20% Idle and 40% at each other condition (time-weighted)

TABLE 19. EXHAUST EMISSIONS FROM A HONDA SL100 MOTORCYCLE WITH AND WITHOUT BLOWBY RECIRCULATION

Condition	Wet Concentrations					
	HC, ppm C	CO, %	CO_2, %	NO, ppm	NO_x, ppm	O_2, %
Idle-stock	12,700	9.40	6.90	31	39	4.3
Idle-recirc.	15,600	9.58	6.71	25	35	4.4
20 RL-stock	7,700	8.37	7.55	89	89	3.4
20 RL-recirc.	8,250	9.12	7.02	71	71	3.7
40 RL-stock	6,100	4.69	9.86	433	433	4.4
40 RL-recirc.	6,250	4.47	9.80	511	511	4.6

Condition	Mass Emissions, g/hr			Mass Emissions, g/mi		
	HC	CO	NO_x	HC	CO	NO_x
Idle-stock	18.1	271	0.185	-	-	-
Idle-recirc.	21.9	272	0.163	-	-	-
20 RL-stock	31.9	700	1.22	1.59	35.0	0.061
20 RL-recirc.	33.6	751	0.964	1.68	37.5	0.048
40 RL-stock	46.7	725	11.0	1.17	18.1	0.275
40 RL-recirc.	48.7	703	13.2	1.22	17.6	0.330

made earlier about the significance of blowby hydrocarbons, CO, and NO_x in the total emissions picture. Using the composite figure for HC

TABLE 20. SUMMARY OF RESULTS OF THE CRANKCASE EMISSIONS (BLOWBY) STUDY CONDUCTED ON THE HONDA SL100 MOTORCYCLE

Condition	*Blowby as % of Exhaust Emissions HC	CO	NO_x	% Control of HC in Blowby by Recirculation
Idle	18.5	0.62	1.55	12
20 RL	20.9	0.37	0.33	76
40 RL	33.1	0.26	0.19	87

*data from Table 18 compared to data from Table 8

from Table 18 (0.421 g/mi) and comparing to the exhaust HC number generated on the LA-4. it appears that crankcase HC from the Honda SL100 tested was about 21% of exhaust HC. This finding supports very well the estimate made in an earlier report(6) that crankcase hydrocarbons could be estimated at "about 20%" of those from 4-stroke motorcycle exhaust.

B. Smoke Emissions (2-stroke engines only) and Particulate Emissions

As described in section III. D. 3., measurements of smoke opacity were taken by continuous recording during the first 505 seconds of the "LA-4" driving route. Figures E-1 through E-3 (Appendix E) are scaled-down reproductions of the recorder traces of speed and smoke opacity for the three 2-stroke bikes. Both speed and opacity were plotted at 3-second intervals except where a smaller interval was necessary to describe the curve properly. Note that the exhaust pipe extension used on the Suzuki was 3 inches in diameter and that those for the other two motorcycles were 2 inches in diameter due to existing exhaust system configurations. This difference in optical path length of the light beam undoubtedly made the Suzuki's smoke density comparatively higher, but it certainly was not the entire cause of the higher density readings for the Suzuki. All the machines tested used automatic oil injection systems, and the oils were supplied by the manufacturers and were those recommended for use in the motorcycles tested. Fresh fuel was used for all runs, because it had been observed earlier that fuel some days old could cause higher-than-normal smoke readings (at least for the Yamaha).

In addition to the measurements taken during the LA-4 runs, a modification of the Federal smoke test procedure for diesel engines was tried on the Suzuki and the Yamaha, consisting of two accelerations and a lug-down (deceleration). Table 21 gives the results of the modified Federal procedure as well as pertinent operating data for each motorcycle. The "a factor" is the average of the 15 highest 1/2-second opacity readings during the two accelerations, and the "b factor" is the average of the 5 highest 1/2-second opacity readings during the decelera-

TABLE 21. MOTORCYCLE SMOKE TEST RESULTS AND SUPPLEMENTARY DATA

SUPPLEMENTARY DATA

SUZUKI T250: Max. Speed = 8000 rpm, Inertia wheel 2, road load, 3-inch pipe

1st acceleration: 3000 to 6000 rpm, gear 2, times 6.0 sec and 6.5 sec
2nd acceleration: 2500 to 6000 rpm, gear 2, times 9.0 sec and 8.5 sec
deceleration: 6000 to 3500 rpm, gear 2, times 7.0 sec and 6.5 sec

YAMAHA DT1-E: Max Speed = 7000 rpm, Inertia wheel 2, road load, 2-inch pipe

1st acceleration: 2500 to 6000 rpm, gear 3, times 5.5 sec and 6.0 sec
2nd acceleration: 2500 to 6000 rpm, gear 4, times 11.0 sec and 11.0 sec
deceleration: 6000 to 3500 rpm, gear 2, times 6.5 sec and 6.5 sec

RESULTS

SUZUKI T250: "a factor" = 8.69% opacity, "b factor" = 20.49% opacity

YAMAHA DT1-E: "a factor" = 1.92% opacity, "b factor" = 1.61% opacity

tion. The results in Table 21 are averages of two runs rather than the normal 3 runs (for heavy-duty vehicles). It should again be noted that the opacity values for the two motorcycles are not directly comparable due to the difference in exhaust pipe diameters.

Particulate emissions from the seven motorcycles are summarized in Table 22, generally representing 3 or 4 runs per data point (range 1 to 7, average about 3.2 runs per data point). The interesting features of these data include the fact that the g/mile rates are relatively uniform for the 4-stroke machines over the four road load conditions, while those for the 2-stroke machines tend to increase with increasing speed. The increase in particulate emissions with power level is even more dramatic for 2-strokes (much more so than for 4-strokes), and the most plausible explanation for these observations lies in the oil injection systems used on the 2-stroke engines. These systems meter oil to various points in the engine (depending on the motorcycle) at a rate which increases with both engine speed and throttle opening, and it is apparent that their effects

TABLE 22. PARTICULATE EMISSIONS DATA FROM SEVEN MOTORCYCLES

4-stroke motorcycles

	Average mg/SCF Exhaust				Average Rate, g/hour				Average Rate, g/mi			
Condition	H-D FLH	Honda CL350K3	Honda SL100	Triumph T120R	H-D FLH	Honda CL350K3	Honda SL100	Triumph T120R	H-D FLH	Honda CL350K3	Honda SL100	Triumph T120R
Idle	2.56	1.52	4.23	4.64	1.61	0.344	0.373	1.22	--	--	--	--
20RL	2.69	0.50	2.44	13.4	3.46	0.242	0.632	5.75	0.173	0.012	0.032	0.287
30RL	3.28	0.14	1.69	12.0	4.46	0.101	0.588	7.68	0.149	0.003	0.020	0.256
40RL	4.52	1.67	1.94	30.8	5.75	1.41	0.917	21.4	0.144	0.035	0.023	0.536
50RL	4.44	2.04	3.06	15.2	6.15	1.84	1.93	13.7	0.123	0.037	0.039	0.275
*20 10%	3.05	1.02	3.17	5.74	4.63	0.902	1.63	3.93	0.232	0.045	0.081	0.197
30 10%	3.37	1.88	--	20.0	5.10	2.17	--	19.8	0.170	0.072	--	0.661
*40 10%	2.35	0.94	4.00	12.2	3.96	1.42	3.06	15.1	0.099	0.035	0.077	0.378
50 10%	4.07	4.02	--	13.1	8.11	6.93	--	19.0	0.162	0.139	--	0.380

*These conditions were actually "20H" and "40H" for the Honda SL100

2-stroke motorcycles

	Average mg/SCF Exhaust			Average Rate, g/hour			Average Rate, g/mi		
Condition	Kaw. 125F-6	Suzuki T250	Yamaha DT1-E	Kaw. 125F-6	Suzuki T250	Yamaha DT1-E	Kaw. 125F-6	Suzuki T250	Yamaha DT1-E
Idle	8.54	14.3	2.64	0.664	1.90	0.282	-	-	-
20RL	4.76	5.48	6.24	1.49	2.34	2.04	0.074	0.117	0.102
30RL	7.04	13.2	6.08	2.83	6.72	2.19	0.094	0.224	0.073
40RL	8.18	8.75	10.7	4.85	6.08	5.72	0.121	0.152	0.143
50RL	16.5	19.6	9.57	16.4	23.9	8.10	0.328	0.478	0.162
**20 10%	16.7	12.1	14.0	17.4	7.96	9.68	0.872	0.398	0.484
**30 10%	28.5	27.8	13.2	41.0	29.8	11.7	1.37	0.995	0.389
40 10%	--	44.0	16.3	--	66.8	21.1	--	1.67	0.528
50 10%	--	49.2	19.4	--	86.5	33.1	--	1.73	0.662
20 20%	--	--	20.1	--	--	19.9	--	--	0.993
30 20%	--	--	25.7	--	--	39.0	--	--	1.30

**These conditions were actually "20H" and "30H" for the Kawasaki 125F-6.

on particulate are visible in the data. The filters used for gravimetric analysis (white when unused) turned a light yellow to brownish-yellow after a sample of 2-stroke exhaust had been collected, indicating retention of oil particles. Most filters used for 4-stroke exhaust, however, turned tan to light brown after use. Notable exceptions to the latter rule were some of the filters used to collect samples from the Triumph and the Honda SL100. The Triumph samples were dark brown to black, and this coloring must have been caused by combustion of lubricating oil (it was later shown that the engine had defective rings), although the exhaust did not smoke noticeably. Filters used during higher speed and load conditions on the Honda SL100 turned a distinct reddish color, even when commercial pump gasoline was used in place of emissions test fuel. Filters used during low speed conditions turned a tan color, much like the other 4-stroke bikes.

Overall, the particulate rates in g/mile were somewhat higher for 2-strokes than for 4-strokes (the Triumph, which was probably atypical, maybe an exception). In order to determine particulate rates which represent real operation to at least some extent, it is necessary to use a composite schedule again as was done for aldehydes. The results of this analysis are shown in Table 23, and are considered reasonable except on the Triumph, as explained earlier. Particulate emissions for the 2-stroke bikes seem to be related to the smoke levels discussed earlier, and are probably functions of oil rate.

TABLE 23. SUMMARY OF WEIGHTED PARTICULATE MASS EMISSIONS FROM SEVEN MOTORCYCLES

Motorcycle	Particulate g/hour	Particulate g/mi
Harley-Davidson FLH	4.38	0.157
Honda CL350K3	1.18	0.042
Honda SL100	0.888	0.032
Kawasaki 125F-6	5.25	0.187
Suzuki T250	15.8	0.564
Triumph T120R	10.4	0.372
Yamaha DT1-E	6.54	0.234

C. Results of Noise Tests

Noise tests were conducted on the Honda SL100, the Kawasaki 125F-6 and a privately-owned Yamaha 175 (not included in any other tests). The tests consisted of accelerations patterned after those required in SAE Standard J986a(12), constant-speed "driveby" tests at 30 mph, and measurements at idle with the machines stationary. Procedures and documentation were given in section III. G., and results are summarized in Table 24. Various standards are currently being enforced on

TABLE 24. SUMMARY OF NOISE TEST RESULTS ON THREE MOTORCYCLES

(All noise measurements in dBA except where noted)

	Motorcycle		
	Honda SL100	Kawasaki 125F-6	Yamaha 175
Acceleration Tests			
Ambient before accel.	45 (55dBC)	44 (68dBC)	47 (64dBC)
Gear used for accel.	3	3	3
Acceleration noise - left	82.8	86.8	83.2
Acceleration noise - right	83.5	84.8	83.2
Ambient after accel.	44 (60dBC)	44 (64dBC)	45 (72dBC)
Driveby Tests			
Ambient before driveby	44 (52dBC)	45 (61dBC)	44dBA, 70dBC
Gear used for driveby	4	4	4 (3)
Driveby noise - left	73.0	75.8	74.0 (77.2)
Driveby noise - right	72.0	73.5	73.0 (78.8)
Ambient after driveby	44 (55dBC)	44 (55dBC)	44dBA, 60dBC
Idle Tests			
Ambient before idle test	45 (60dBC)	44 (60dBC)	45 (60dBC)
Idle noise - left	62.5	69.5	69.5
Idle noise - front	63.0	67.2	69.2
Idle noise - right	64.8	68.0	69.8
Idle noise - rear	65.5	68.2	70.8
Ambient after idle test	44 (55dBC)	44 (65dBC)	45 (63dBC)

motorcycles as well as other vehicles, and the noise levels from the motorcycles tested would be within some limits and not within others. The SAE standard (which has little bearing on regulations) for light-duty vehicles during the acceleration test is 86dBA, to give just one example.

All the measurements are given in dBA (to correlate with human ear response), and in addition, the ambient measurements are also given in dBC (flat response - no frequency dependence). The slightly different format for driveby tests on the Yamaha 175 is an attempt to avoid confusion due to the use of two different gears. It is apparent that in this case the use of a lower (numerical) gear, which increased the engine speed, did increase the noise level.

V. ESTIMATION OF EMISSION FACTORS AND NATIONAL IMPACT

To develop reasonable motorcycle emission factors, it is necessary to know the motorcycle population to such an extent that available emissions data can be extrapolated logically. A good description of the population is also necessary to estimation of national impact, because both the number of motorcycles in service and their distribution over the range of available sizes and types are direct inputs to the impact calculation. Consequently, this report section will be broken up into three parts, covering analysis of the motorcycle population, development of emission factors, and estimation of national impact as logically separate items.

A. Analysis of the Motorcycle Population

The population of motorcycles in use in the United States is undergoing rapid changes in both composition and overall size. The tremendous growth of the industry since about 1960 parallels that which has occurred in other recreation-oriented fields, and keeping up with the statistics has been a problem. In that at least some motorcycles are registered for street use, some reliable (if usually outdated) statistics are available. On the other hand, so many bikes are now used exclusively off-road (and unregistered) that total population statistics are largely a matter of speculation.

A summary of some of the more comprehensive registration and sales data is given in Table 25, noting that it comes from several fairly diverse sources. Where possible, data from Alaska and Hawaii have been excluded from the figures, restricting the analysis to the contiguous states plus the District of Columbia. These exclusions

TABLE 25. SUMMARY OF MOTORCYCLE REGISTRATION AND SALES DATA

Year	Total Registrations(16)	Change in Registrations	Industry Sales(17)
1972	3,765,000[a]	439,493	1,800,000[a]
1971	3,325,507	510,807	1,584,800
1970	2,814,700	519,700	1,130,100
1969	2,295,000	195,000	671,700
1968	2,100,000	147,000	481,000[b]
1967	1,953,000	200,000	389,000[b]
1966	1,753,000	-------	342,000[c]

[a] estimate [b] derived from data given in Reference 18
[c] extrapolated

were not possible, however, for the sales data. One note of explanation on the sales data is that they are based on import figures with an allowance added for motorcycles of domestic manufacture.

The outstanding fact in evidence from the data in Table 25 is that motorcycle sales are far outstripping new registrations. The causes of this phenomenon are that many motorcycles are being sold for off-road use only (and are never registered), and that a substantial number of older motorcycles are being retired from service. It remains to make a reasonable estimate of the current (December 31, 1972) motorcycle population using the available facts as basis, proceeding on a more or less trial-and-error basis.

To begin, ranges can be established for quantities which are known to exist, for example, it might be assumed that the percentage of motorcycles in the country which is not registered is between 10% and 30%. It could also be assumed that the average age of a motorcycle in service is between 2 and 5 years, and that the average life of a motorcycle is between 3 and 7 years. In addition, the percentage of motorcycles of a given year which is still in service is probably a function of motorcycle age. A range for this quantity which could be assumed is that 10% to 20% of the motorcycles sold in a given year retire from service in every year that passes. That is, 80% to 90% of sales for year k would still be in service in year k + 1, 60% to 80% would still be serviceable in year k + 2, and so on. Put another way, the percentage of machines sold in any given year still in service would decrease linearly to zero over a period of 5 to 10 years. This longevity function is obviously not entirely correct, but is probably a good enough approximation to yield useful results.

In order to calculate values for all the other quantities, it is really necessary only to assume a value for the constant in the longevity function. The results of calculations performed in this manner are given in Table 26, with the assumption (where necessary) that sales increased linearly from 60,000 in 1960 to 389,000 in 1967. It was also assumed for calculations that as of the end of 1972, the average age of motorcycles sold in 1972 was 0.5 year, the average for those sold in 1971 was 1.5 years, and so forth. Examining the statistics in Table 26, it is at first evident that the last assumption yields an impossible situation, namely that the calculated population is smaller than the number of registrations. Progressing upward from the bottom of the table, the combination of statistics becomes more plausible, at least up to about the third line (assumption of 10% per year retired). Although the number is not presently a known quantity, the percentage of machines currently in the population which are even capable of off-road operation would place some kind of upper limit on the unregistered percentage. The limited amount of information available on this point(19) indicates that the figure may be near 40%, but better information should be available from the Motorcycle Industry Council (MIC) before long.

TABLE 26. MOTORCYCLE POPULATION STATISTICS CALCULATED BY ASSUMING A SERIES OF RETIREMENT RATES

Percent of Original Number Retired per Yr.	Calculated Population 12/31/72	Percent Unregistered	Average Age, yr	Average Life, yr
8.3	5,398,000	30.3	2.31	6.0
9.1	5,223,000	27.9	2.20	5.5
10	5,022,000	25.0	2.07	5.0
11.1	4,796,000	21.5	1.94	4.5
12.5	4,544,000	17.1	1.81	4.0
14.3	4,260,000	11.6	1.66	3.5
16.7	3,931,000	4.2	1.51	3.0
20	3,544,000	-	1.36	2.5

Having presented the available data, it becomes necessary to make an assumption based on best judgement, and that assumption is that there were 5 million motorcycles in use in the United States as of 12/31/72. If it is shown later that this assumption is erroneous, it should be a relatively simple matter to correct subsequent calculations. It should be noted that this estimate does not include minibikes or bicycles with auxillary engines, but that it does include scaled-down motorcycles intended for use by young people (Yamaha Mini-Enduro, Honda SL70, etc.).

Attention now must be directed toward the composition of the motorcycle population according to size and type of engine used. Data currently available on this point are given in Table 27, although it is anticipated that more comprehensive information will be available shortly from the MIC statistical survey. Since no data to the contrary have been found, it will be assumed for calculation purposes that the current motorcycle population is 60% 4-strokes and 40% 2-strokes. It is not quite so simple to arrive at the compositions of the 2- and 4-stroke populations by size, however, but supplementary information regarding sales trends can be very helpful.

Until the past few years, it has been traditional that street riders prefer 4-stroke machines, since no large, fast 2-stroke machines have been available (except competition bikes). Likewise it has been customary that dirt riders prefer 2-strokes because of their lighter weight and greater simplicity. The market now offers such a variety of machines, however, that these old distinctions are no longer valid. Put another way, there is now more of an equality of offerings among 2-strokes and 4-strokes and there is little justification for supposing that sales breakdowns by engine size should be greatly different for the two engine types. Based on this generalization, some of the data from Table 27, and the population model from Table 26 (10% retirement per year), a distribution of the U.S. motorcycle population by size (both 2-stroke and 4-stroke) has been calculated and is given in Table 28. This distribution will be used in conjunction with emissions test data and motorcycle usage information to develop emission factors and impact estimates in the following report subsections. It would be desirable to use a distribution having a better category breakdown for the larger machines, but the most reliable data simply are not broken down so accurately.

TABLE 27. BREAKDOWN OF U.S. MOTORCYCLE POPULATION ACCORDING TO ENGINE SIZE AND TYPE

1969 Sales Data (20)			
Displacement cm^3	% of 2-strokes	% of 4-strokes	% of total
Under 100	16.7	41.9	33.0
100-139	38.8	2.4	15.4
140-199	12.0	9.0	10.1
200-299	21.1	2.2	8.9
300-439	8.2	21.0	16.3
440-699	3.0	15.9	11.4
700 and over	0	7.6	4.9

1971 Sales Data(19)	
Displacement, cm^3	% of total
49-100	33
120-250	27
305-360	15
440-750	12
Over 750	3

Displacement cm^3	% of Total Imports for Year(17)			
	1969	1970	1971	1972*
0-50	22.9	15.0	8.2	5.7
51-90	21.4	27.1	24.7	20.0
91-190	22.7	22.1	26.9	31.3
191-290	9.4	6.7	7.2	9.2
over 290	21.9	27.4	30.1	31.0
unclassified	1.7	1.7	2.9	2.8

*January-May

Year	% of Market for 2-strokes	% of Market for 4-strokes
1969(20)	38	62
1970(19)	40	60
1971(17)	40	60

TABLE 28. DISTRIBUTION OF U.S. MOTORCYCLES BY ENGINE SIZE

Displacement, cm^3	% of Population	Number in Service
0-50	10	500,000
51-90	24	1,200,000
91-190	28	1,400,000
191-290	8	400,000
over 290	30	1,500,000

B. Development of Emission Factors

The end products required in this subsection are characteristic emission rates for each of the motorcycle size categories listed in Table 28, which can then be combined to yield characteristic emission rates for the entire motorcycle population. Data acquired during the testing phase of this program indicate that emission rates are not simple functions of engine displacement or motorcycle size, and thus another approach will be used in estimating rates for each category. If composite emission rates from the machines tested (such as LA-4 data and composite aldehydes and particulates) are plotted as functions of engine displacement, envelopes can be drawn indicating the range of values to be expected. Points within these envelopes which are thought to be representative of each category can be chosen, and the emission rates at those points can be assumed as typical for the respective categories. This type of analysis is certainly not rigorous, but is really the only realistic approach to be taken since so few data are available. At some later date, when emissions data on a much larger number of motorcycles (perhaps 100 or more) are available, a good statistical analysis can be made. Mass emissions calculated by the process above are given in Table 29, which also includes values for SO_x based on fuel consumption and an allowance for crankcase hydrocarbon emissions from 4-strokes based on test results given in section IV.A.4. The estimates for HC, CO, and NO_x are based on LA-4 results, and those for RCHO and particulate are based on a composite of steady-state

TABLE 29. TYPICAL MASS EMISSIONS FROM MOTORCYCLES AS FUNCTIONS OF ENGINE SIZE AND TYPE

Engine Type	Engine Disp., cm^3	Emissions in g/mile					
		*HC	CO	NO_x	RCHO	Particulate	†SO_x
4-stroke	0-50	2.2	19.	0.53	0.015	0.020	0.013
	51-90	2.3	21.	0.35	0.021	0.025	0.015
	91-190	2.6	24.	0.32	0.026	0.030	0.017
	191-290	3.4	32.	0.17	0.044	0.045	0.022
	over 290	4.8	46.	0.11	0.079	0.070	0.031
2-stroke	0-50	5.	5.	0.24	0.095	0.12	0.020
	51-90	7.	7.	0.20	0.10	0.15	0.022
	91-190	10.	12.	0.16	0.11	0.19	0.025
	191-290	18.	30.	0.04	0.13	0.35	0.043
	over 290	25.	50.	0.04	0.14	0.55	0.057

*includes 20% increase for 4-strokes to account for crankcase losses, but does not include evaporative losses

† calculated from fuel consumption

conditions. The fuel consumption used to calculate SO_x was that observed in LA-4 runs.

Several items of information are available on distances traveled by motorcycle riders annually, and the averages seem to range from about 3000 to 5000 miles per year. One source(19) estimated about 3900 miles per year for California riders based on a sample corrected for brand-name ownership and preference for street or dirt riding. Data from the Department of Transportation(21) include an estimate of 3605 miles per year for 1970, presumably based on street and highway travel only. An EPA report(22) issued some time ago estimated 5000 miles per year based on 3 references and another source estimated 4700 miles per year based on a survey of magazine subscribers, but it is not known whether this latter sample was corrected for composition or not.

Some of the dynamics of the mileage situation which are presently occurring are that an increasing number of riders are making long tours, which tends to increase average mileage. On the other hand, many riders are entering motorcycling as a second or third sport, and consequently participate at a level lower than that of the real enthusiast. Perhaps the best way of judging the number of miles a rider may cover in a year is to look at the distance capabilities of his motorcycle. It is doubtful that many riders would attempt much of a trip on less than a $350cm^3$ machine these days, due to both rider comfort and safety considerations. Almost all street machines of $350 cm^3$ displacement or more have performance and comfort which is acceptable for long trips, but as a general rule it would be expected that for street machines annual mileage would still be positively related to motorcycle size.

For the purposes of this report, the annual mileage assumptions which will be used are 2500 mi/yr for the 0-50 cm^3 category, 3000 mi/yr for the 51-90 cm^3 category, and 3500, 4000, and 5000 mi/yr for the other categories in order of increasing displacement. When weighted by the population estimates in Table 28, these assumptions yield an average for all motorcycles of 3770 mi/yr, which is considered a reasonable result. These mileages and the average will be assumed applicable to off-road as well as highway usage.

Based on all the foregoing analysis and qualifications, emission factors for motorcycles in the United States have been calculated and are presented in Table 30. Evaporative emissions were calculated using the method described in section III. F. 1., assuming that they occurred only during the riding season in each part of the country, and the results are shown in Table 30. For this purpose, it was assumed that the U. S. was divided into three regions. The north region was assumed to be between 49° and 43° north latitude and to have a 6-month riding season, the central region between 43° and 37° and to have an 8-month riding season, and the south region between 37° and 31° and to have a 10-month riding season.

TABLE 30. EMISSION FACTORS FOR MOTORCYCLES (DEC. 31, 1972)

Pollutant	Engine Type	g/mile	g/unit year
Exhaust Hydrocarbons	4-stroke	2.9	10,900
	2-stroke	16.	59,400
Crankcase Hydrocarbons	4-stroke	0.6	2,200
	2-stroke	-	-
Evaporative Hydrocarbons	4-stroke	-	1,360
	2-stroke	-	1,360
Total Hydrocarbons	4-stroke	3.5	14,500
	2-stroke	16.	60,800
CO	4-stroke	33.	123,000
	2-stroke	27.	103,000
NO_x as NO_2	4-stroke	0.24	918
	2-stroke	0.12	434
RCHO as HCHO	4-stroke	0.047	177
	2-stroke	0.11	431
Particulates	4-stroke	0.046	172
	2-stroke	0.33	1,260
SO_x as SO_2	4-stroke	0.022	84
	2-stroke	0.038	145

Based on estimated 1972 registration data(17), about 13% of the motorcycles are in the north region, 46% in the central region, and 41% in the south region. The final units in which the emission factors have been expressed, g/mile and g/motorcycle year, are used because they can be related easily to available population statistics for the purpose of computing national impact. These units are considered more practical than fuel-based units because motorcycle fuel is not easily separated from that sold for use in other vehicles. The factors do depend to some extent on the composition of the motorcycle population, but calculation of new factors based on later population data would be a relatively simple matter.

Note that the g/mile estimates in Table 30 are for the U. S. motorcycle population weighted by size and mileage. In other words, they are the g/unit year estimates divided by 3770 miles (except HC, where the "g/unit year" figure includes evaporation and the "g/mile" figure does not).

If factors or impact on a more limited basis are desired, calculation should start with data given in Table 29, then the size distribution and mileage for the new sample can be used properly in arriving at a new result.

C. Estimation of National Impact

The emission factors from Table 30 need only to be multiplied by the estimated motorcycle population to compute the national impact of motorcycle emissions. This step has been taken and the results appear as Table 31. Placing these results in perspective, Table 32 shows motorcycle emissions as percentages of EPA National Inventory Data, but it should be noted that the inventory data are for 1970, not 1972. The changes foreseen in the near future which affect motorcycle emissions and their importance include the rapidly expanding motorcycle population, reduction of other source emissions due to control programs already in force, and the probable advent of Wankel engines in motorcycles. The first two considerations will tend to emphasize the importance of motorcycles as compared to other sources, but the last will probably have the opposite effect if 2-stroke engines are the type most replaced by the Wankel. The extent to which these factors and others will change the impact of

TABLE 31. NATIONAL IMPACT ESTIMATES FOR MOTORCYCLE EMISSIONS (Dec. 31, 1972)

Engine Type	Units in Service	Pollutant	Total Emissions, ton/yr
4-stroke	3,000,000	Hydrocarbons	47,900
		CO	407,000
		NO_x as NO_2	3,040
		RCHO as HCHO	585
		Particulates	569
		SO_x as SO_2	278
2-stroke	2,000,000	Hydrocarbons	134,000
		CO	227,000
		NO_x as NO_2	957
		RCHO as HCHO	950
		Particulates	2,780
		SO_x as SO_2	320
Total	5,000,000	Hydrocarbons	182,000
		CO	634,000
		NO_x as NO_2	4,000
		RCHO as HCHO	1,540
		Particulates	3,350
		SO_x as SO_2	598

TABLE 32. COMPARISON OF MOTORCYCLE NATIONAL IMPACT ESTIMATES WITH EPA NATIONWIDE AIR POLLUTANT INVENTORY DATA

Contaminant	1970 EPA Inventory Data 10^6 tons/yr$^{(23)}$		Motorcycle Estimates as % of	
	All Sources	Mobile Sources	All Sources	Mobile Sources
HC	34.7	19.5	0.524	0.933
CO	147.	111.	0.431	0.571
NO_x	22.7	11.7	0.0176	0.0342
SO_x	33.9	1.0	0.0018	0.060
Particulates	25.4	0.7	0.0132	0.479

motorcycle emissions is difficult to predict, but the overall direction of change expected is toward motorcycles becoming more significant in the nationwide air pollution picture.

As mentioned in the previous subsection, registration figures indicate that about 13% of motorcycles are in the north region, 46% in the central region, and 41% in the south region. It has also been estimated that about 65% of total motorcycle mileage is accumulated in urban/suburban (rather than rural)areas(19, 24). Combining these numbers with the estimates made earlier about length of the riding season in the three regions, mass emissions from motorcycles can be categorized as shown in Table 33. The longer riding season in the south region gives it a little more weight in the overall emissions picture than is indicated by population statistics alone, and the seasonal effect reduces mass emissions in the other two regions slightly from those which would be expected based on motorcycle distribution. According to this analysis, the midsummer months account for 35% of motorcycle emissions, while spring accounts for about 34%, fall for 27%, and winter for 5%.

TABLE 33. SUMMARY OF SEASONAL, REGIONAL, AND URBAN-RURAL VARIATION OF MOTORCYCLE EMISSIONS

Region	Percentage of Annual Nationwide Emissions by Season								Regional Subtotals
	Urban/Suburban Areas				Rural Areas				
	Dec.-Feb.	Mar.-May	Jun.-Aug.	Sep.-Nov.	Dec.-Feb.	Mar.-May	Jun.-Aug.	Sep.-Nov.	
North	0.0	2.0	3.0	1.0	0.0	1.1	1.6	0.5	9.2
Central	0.0	10.5	10.5	7.0	0.0	5.6	5.6	3.8	43.0
South	3.1	9.3	9.3	9.3	1.7	5.0	5.0	5.0	47.7
Seasonal Subtotals	3.1	21.8	22.8	17.3	1.7	11.7	12.2	9.3	
Totals			65.0				34.9		99.9

VI. SUMMARY

This report is the end product of a study on exhaust emissions from motorcycles, and it is Part 3 of a planned seven-part final report on "Exhaust Emissions from Uncontrolled Vehicles and Related Equipment Using Internal Combustion Engines," Contract No. EHS 70-108. It includes test data, documentation, and discussion on studies which characterized in detail emissions from seven motorcycles (four 4-stroke machines and three 2-strokes), as well as estimated emission factors and national emissions impact. As a part of the final report on the characterization phase of EHS 70-108, this report does not include information on aircraft turbine emissions, outboard motor crankcase drainage, or locomotive emissions control technology. As required by the contract, these three latter areas have been or will be reported on separately.

Emission measurements on the seven motorcycles were performed with the machines operating on a modified automotive chassis dynamometer in the Emissions Research Laboratory. Road tests were conducted both on the Institute grounds and on a nearby test course, and noise measurements were taken at the abandoned Hondo (Texas) airbase which the Institute rents as necessary. Exhaust emissions were measured during the "7-mode" (1970-71 Federal Light Duty Vehicle) Procedure, the "LA-4" (1972 and later Federal L. D. V.) Procedure, and a series of steady-state conditions developed specifically for each motorcycle.

Exhaust constituents measured during one or more of the three procedures were total hydrocarbons by FIA; NO and NO_x by chemiluminescence; hydrocarbons, CO, CO_2, and NO by NDIR: O_2 by electrochemical analyzer; light hydrocarbons by gas chromatograph; aldehydes by wet chemistry; and particulates by an experimental dilution-type sampling device. In addition, crankcase or "blowby" emissions from one motorcycle were characterized, and fuel evaporative losses and SO_x emissions were calculated rather than being measured. Sound level measurements were conducted on 3 motorcycles using fairly standard instrumentation during acceleration, constant-speed operation, and idling. Emission factors and national impact were calculated for hydrocarbons, CO, and NO_x from data developed on the 1975 Federal Procedure (LA-4); for SO_x, particulates, and aldehydes,on the basis of a composite of steady-state conditions. Expressing motorcycle emissions as percentages of 1970 national totals from all sources, motorcycles are estimated to account for about 0.5% of hydrocarbons, 0.4% of CO, 0.02% of NO_x, 0.002% of SO_x, and 0.01% of particulates. As percentages of 1970 national totals from mobile sources only, motorcycles are estimated to be responsible for 0.9% of hydrocarbons, 0.6% of CO, 0.03% of NO_x, 0.06% of SO_x, and 0.5% of particulates. The impact of motorcycle emissions has been estimated for three regions, based on registration data, with the result that about 9% of motorcycle emissions are estimated to occur in the north region, 43% in the central region, and 48% in the south region.

The air pollution impact of motorcycles on individual metropolitan areas is not known at this time. Nationwide and regional emissions are only rough indicators of the actual air quality impact of any source on an urban area.

It should be recognized that the subject study is only a first step toward a real understanding of motorcycle emissions, and that tests on a great many more machines are needed to obtain an accurate baseline emissions estimate. It has likewise been impossible in the subject study to gain any knowledge at all about emissions variability from one machine to another of the same type or about variation in emission levels with age. Additional attention to possible control technology ideas and the development of a better-suited chassis dynamometer specifically for motorcycle operation are two more items which have been entirely neglected thus far. These comments give some indication of the direction in which future motorcycle emissions work should proceed in order to maintain a reasonably quantitative evaluation of a potentially important emission source.

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APPENDIX A

Motorcycle Road Test and
Dynamometer Simulation Data

SOUTHWEST RESEARCH INSTITUTE
DATA SHEET

SUBJECT MOTORCYCLE ROAD TEST AND DYNAMOMETER SIMULATION DATA

SHEET NO.____ OF ____ SHEETS
PROJECT 11-2869-01
DATE 4/21/71
BY HARE

MOTORCYCLE HARLEY-DAVIDSON FLH WEIGHT AS TESTED 697 lbf

AMBIENT TEMPERATURE 78 °F CORRECTED ATM. PRESS. 28.91 in Hg

SPEEDOMETER CALIBRATION, mi/hr

ACTUAL	INDICATED RUN 1	INDICATED RUN 2	INDICATED AVERAGE
10	10	10	10
20	20	20	20
30	31	31	31
40	42	42	42
50	52	53	53

INLET VACUUM, in Hg

TRUE SPEED	GEAR	RUN 1	RUN 2	AVERAGE
20	2	10.3	10.5	10.4
30	3	9.5	9.8	9.6
40	3	9.8	9.9	9.8
50	4	8.2	8.6	8.4

40 mi/hr-TO-20 mi/hr COASTING TIMES

OPERATOR	DIRECTION	TIME, sec
R	A	25.0
R	B	23.5
D	A	25.6
D	B	23.7
	AVERAGE TIME	24.4

20 mi/hr-TO-40 mi/hr ACCELERATION TIMES

OPERATOR	DIRECTION	TIME, sec
R	A	4.1
R	B	3.8
D	A	3.8
D	B	4.0
	AVERAGE TIME	3.9
	GEAR	2

DYNAMOMETER SIMULATION DATA

	40-20 COASTING TIMES, sec				20-40 ACCELERATION TIMES, sec			
INERTIA WHEEL(S)	RUN 1	RUN 2	RUN 3	CONSENSUS	RUN 1	RUN 2	RUN 3	CONSENSUS
1	17.0	18.5	—	17.8	—	—	—	—
1 AND 2	26.5	27.0	—	26.8	4.0	4.1	—	4.0
1 AND 4	23.7	24.5	—	24.1	3.7	3.5	—	3.6

INLET VACUUM, in Hg

SPEED, mi/hr	GEAR	LOAD = 0 RUN 1	LOAD = 0 RUN 2	LOAD = 0 AVG.	LOAD = hp@ mi/hr RUN 1	LOAD = hp@ mi/hr RUN 2	LOAD = hp@ mi/hr AVG.	LOAD = hp@ mi/hr RUN 1	LOAD = hp@ mi/hr RUN 2	LOAD = hp@ mi/hr AVG.
20	2	10.4	10.2	10.3						
30	3	9.6	9.6	9.6						
40	3	9.6	9.8	9.7						
50	4	8.4	8.4	8.4						

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SUBJECT MOTORCYCLE ROAD TEST AND DYNAMOMETER SIMULATION DATA

SHEET NO. ____ OF ____ SHEETS
PROJECT 11-2869-01
DATE 4/20/71
BY HARE

MOTORCYCLE HONDA CL350 K3   WEIGHT AS TESTED 355 lbs
AMBIENT TEMPERATURE 72 °F   CORRECTED ATM. PRESS. 28.96 in Hg

SPEEDOMETER CALIBRATION, mi/hr

	INDICATED		
ACTUAL	RUN 1	RUN 2	AVERAGE
10	—	—	—
20	20	20	20
30	32	31	32
40	42	41	42
50	53	52	52

INLET VACUUM, in Hg

TRUE SPEED	GEAR	RUN 1	RUN 2	AVERAGE
20	3	8.9	8.3	8.6
30	4	5.1	7.7	6.4
40	4	6.5	6.5	6.5
50	5	3.0	3.5	3.2

40 mi/hr-TO-20 mi/hr COASTING TIMES

OPERATOR	DIRECTION	TIME, sec
R	A	22.0
R	B	24.8
D	A	21.5
D	B	25.2
	AVERAGE TIME	23.4

20 mi/hr-TO-40 mi/hr ACCELERATION TIMES

OPERATOR	DIRECTION	TIME, sec
R	A	5.7
R	B	5.7
D	A	5.9
D	B	5.2
	AVERAGE TIME	5.6

GEAR 3

DYNAMOMETER SIMULATION DATA

	40-20 COASTING TIMES, sec				20-40 ACCELERATION TIMES, sec			
INERTIA WHEEL(S)	RUN 1	RUN 2	RUN 3	CONSENSUS	RUN 1	RUN 2	RUN 3	CONSENSUS
4	17.0	17.5	—	17.2	4.9	5.2	—	5.0
2	20.0	22.5	22.5	22.5	6.0	6.2	—	6.1

INLET VACUUM, in Hg

SPEED,		LOAD = 0			LOAD = hp@ mi/hr			LOAD = hp@ mi/hr		
mi/hr	GEAR	RUN 1	RUN 2	AVG.	RUN 1	RUN 2	AVG.	RUN 1	RUN 2	AVG.
20	3	7.0	9.0	8.0						
30	4	5.7	6.2	6.0						
40	4	3.8	4.1	4.0						
50	5	3.5	3.5	3.5						

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SUBJECT MOTORCYCLE ROAD TEST AND DYNAMOMETER SIMULATION DATA

SHEET NO. ____ OF ____ SHEETS
PROJECT 11-2869-01
DATE 6/22/72
BY ________

MOTORCYCLE HONDA SL-100
WEIGHT AS TESTED 220 lbf
AMBIENT TEMPERATURE 90 °F
CORRECTED ATM. PRESS. 29.20 in Hg

SPEEDOMETER CALIBRATION, mi/hr

	INDICATED		
ACTUAL	RUN 1	RUN 2	AVERAGE
10	10.5	11.0	11.0
20	22.0	22.0	22.0
30	33.0	33.0	33.0
40	44.0	43.5	44.0
50	55.0	55.0	55.0

INLET VACUUM, in Hg

TRUE SPEED	GEAR	RUN 1	RUN 2	AVERAGE
20				
30				
40				
50				

45 mi/hr-TO-25 mi/hr COASTING TIMES

OPERATOR	DIRECTION	TIME, sec
J	A	18.3
J	B	13.7
D	A	17.7
D	B	15.0
	AVERAGE TIME	16.2

25 mi/hr-TO-45 mi/hr ACCELERATION TIMES

OPERATOR	DIRECTION	TIME, sec
J	A	9.4
J	B	10.4
D	A	9.0
D	B	9.8
	AVERAGE TIME	9.6

GEAR 4.

DYNAMOMETER SIMULATION DATA

	45-25 COASTING TIMES, sec				25-45 ACCELERATION TIMES, sec			
INERTIA WHEEL(S)	RUN 1	RUN 2	RUN 3	CONSENSUS	RUN 1	RUN 2	RUN 3	CONSENSUS
6	12.1	—	—	LOW	8.4	—	—	LOW
4	14.5	14.5	15.1	LOW	9.2	9.1	9.1	LOW
5 & 6	15.6	15.6	14.8	LOW	9.3	9.3	—	LOW
4 & 6	16.9	16.7	17.0	16.9	9.7	9.1	9.4	9.4

INLET VACUUM, in Hg

		LOAD = 0			LOAD = hp@ mi/hr			LOAD = hp@ mi/hr		
SPEED mi/hr	GEAR	RUN 1	RUN 2	AVG.	RUN 1	RUN 2	AVG.	RUN 1	RUN 2	AVG.
20										
30										
40										
50										

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SUBJECT MOTORCYCLE ROAD TEST AND DYNAMOMETER SIMULATION DATA

SHEET NO. ____ OF ____ SHEETS
PROJECT 11-2869-01
DATE 6/22/72
BY ________

MOTORCYCLE KAWASAKI 125F-6 WEIGHT AS TESTED 248 lb_f
AMBIENT TEMPERATURE 90 °F CORRECTED ATM. PRESS. 29.20 in H_g

SPEEDOMETER CALIBRATION, mi/hr

	INDICATED		
ACTUAL	RUN 1	RUN 2	AVERAGE
10	12.0	12.0	12.0
20	21.0	21.0	21.0
30	30.0	31.0	30.5
40	40.5	41.0	41.0
50	50.0	50.5	50.0

INLET VACUUM, in H_g

TRUE SPEED	GEAR	RUN 1	RUN 2	AVERAGE
20				
30				
40				
50				

45 mi/hr-TO-25 mi/hr COASTING TIMES

OPERATOR	DIRECTION	TIME, sec
J	A	18.0
J	B	14.5
D	A	18.0
D	B	15.0
	AVERAGE TIME	16.4

25 mi/hr-TO-45 mi/hr ACCELERATION TIMES

OPERATOR	DIRECTION	TIME, sec	
J	A	10.2	10.0
J	B	12.5	12.5
D	A	10.2	9.8
D	B	10.8	11.2
	AVERAGE TIME	10.9	

GEAR 4

DYNAMOMETER SIMULATION DATA

		45-25 COASTING TIMES, sec				25-45 ACCELERATION TIMES, sec			
INERTIA WHEEL(S)		RUN 1	RUN 2	RUN 3	CONSENSUS	RUN 1	RUN 2	RUN 3	CONSENSUS
RESTRAINED TOO TIGHTLY	4 & 6	11.0	12.8	—	LOW	9.3	9.2	9.0	LOW
	4 & 5	12.3	13.1	—	LOW	9.6	9.5	—	LOW
	2	11.2	12.2	13.0	LOW	9.2	—	—	LOW
	1 & 5	13.8	14.6	—	LOW	11.3	11.8	—	
	1 & 5	16.3	17.0	17.1	16.8	10.5	10.9	11.0	10.8

INLET VACUUM, in H_g

SPEED mi/hr	GEAR	LOAD = 0			LOAD= hp@ mi/hr			LOAD= hp@ mi/hr		
		RUN 1	RUN 2	AVG.	RUN 1	RUN 2	AVG.	RUN 1	RUN 2	AVG.
20										
30										
40										
50										

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SHEET NO. ____ OF ____ SHEETS
PROJECT 11-2869-01
DATE 4/21/71
BY HARE

SUBJECT MOTORCYCLE ROAD TEST AND DYNAMOMETER SIMULATION DATA

MOTORCYCLE SUZUKI T-250R
WEIGHT AS TESTED 339 lb_f
AMBIENT TEMPERATURE 78 °F
CORRECTED ATM. PRESS. 28.91 in Hg

SPEEDOMETER CALIBRATION, mi/hr

ACTUAL	INDICATED RUN 1	RUN 2	AVERAGE
10	9	11	10
20	19	21	20
30	31	31	31
40	42	42	42
50	52	52	52

INLET VACUUM, in Hg

TRUE SPEED	GEAR	RUN 1	RUN 2	AVERAGE
20	3	1.8	1.8	1.8
30	4	1.5	1.8	1.6
40	4	2.0	2.0	2.0
50	5	2.0	2.0	2.0

40 mi/hr-TO-20 mi/hr COASTING TIMES

OPERATOR	DIRECTION	TIME, sec
R	A	22.1
R	B	22.6
D	A	21.2
D	B	21.9
	AVERAGE TIME	22.0

20 mi/hr-TO-40 mi/hr ACCELERATION TIMES

OPERATOR	DIRECTION	TIME, sec
R	A	5.5
R	B	5.6
D	A	5.6
D	B	5.5
	AVERAGE TIME	5.6

GEAR 2

DYNAMOMETER SIMULATION DATA

INERTIA WHEEL(S)	40-20 COASTING TIMES, sec RUN 1	RUN 2	RUN 3	CONSENSUS	20-40 ACCELERATION TIMES, sec RUN 1	RUN 2	RUN 3	CONSENSUS
2	24.5	24.3	—	24.4	5.2	5.1	—	5.2

INLET VACUUM, in Hg

SPEED, mi/hr	GEAR	LOAD = 0 RUN 1	RUN 2	AVG.	LOAD = hp @ mi/hr RUN 1	RUN 2	AVG.	LOAD = hp @ mi/hr RUN 1	RUN 2	AVG.
20	3	1.6	1.8	1.7						
30	4	1.3	1.5	1.4						
40	4	1.5	1.6	1.6						
50	5	2.0	2.0	2.0						

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SHEET NO.____ OF ____ SHEETS
PROJECT 11-2869-01
DATE 4/30/71
BY HARE

SUBJECT MOTORCYCLE ROAD TEST AND DYNAMOMETER SIMULATION DATA

MOTORCYCLE TRIUMPH T120R WEIGHT AS TESTED 417 lbs
AMBIENT TEMPERATURE 82 °F CORRECTED ATM. PRESS. 29.18 in Hg

SPEEDOMETER CALIBRATION, mi/hr

ACTUAL	INDICATED RUN 1	RUN 2	AVERAGE
10	11	10	10
20	20	20	20
30	30	31	30
40	41	41	41
50	52	52	52

INLET VACUUM, in Hg

TRUE SPEED	GEAR	RUN 1	RUN 2	AVERAGE
20	2	7.0	6.9	7.0
30	3	5.9	6.4	6.2
40	3	4.6	5.3	5.0
50	4	4.3	3.2	3.8

40 mi/hr-TO-20 mi/hr COASTING TIMES

OPERATOR	DIRECTION	TIME, sec
R	A	20.8
R	B	23.4
D	A	19.4
D	B	23.8
	AVERAGE TIME	21.8

20 mi/hr-TO-40 mi/hr ACCELERATION TIMES

OPERATOR	DIRECTION	TIME, sec
R	A	3.1
R	B	3.2
D	A	3.6
D	B	3.3
	AVERAGE TIME	3.3
	GEAR	2

DYNAMOMETER SIMULATION DATA

	40-20 COASTING TIMES, sec				20-40 ACCELERATION TIMES, sec			
INERTIA WHEEL(S)	RUN 1	RUN 2	RUN 3	CONSENSUS	RUN 1	RUN 2	RUN 3	CONSENSUS
1	17.0	—	—	17.0	3.0	—	—	3.0
1 AND 5	20.0	21.9	21.1	21.0	4.0	4.0	—	4.0
1 AND 6	21.2	20.2	21.0	20.8	4.0	3.2	3.4	3.5

INLET VACUUM, in Hg

SPEED		LOAD = 0			LOAD = hp@ mi/hr			LOAD = hp@ mi/hr		
mi/hr	GEAR	RUN 1	RUN 2	AVG.	RUN 1	RUN 2	AVG.	RUN 1	RUN 2	AVG.
20	2	7.0	7.0	7.0						
30	3	6.5	6.5	6.5						
40	3	4.5	4.3	4.6						
50	4	3.4	3.6	3.5						

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SUBJECT MOTORCYCLE ROAD TEST AND DYNAMOMETER SIMULATION DATA

SHEET NO.____ OF ____ SHEETS
PROJECT 11-2869-01
DATE 4/20/71
BY HARE

MOTORCYCLE YAMAHA DT1-E WEIGHT AS TESTED 279 lbf
AMBIENT TEMPERATURE 72 °F CORRECTED ATM. PRESS. 28.96 in Hg

SPEEDOMETER CALIBRATION, mi/hr

ACTUAL	INDICATED RUN 1	INDICATED RUN 2	INDICATED AVERAGE
10	12	11	12
20	22	22	22
30	33	33	33
40	43	44	44
50	53	53	53

INLET VACUUM, in Hg

TRUE SPEED	GEAR	RUN 1	RUN 2	AVERAGE
20	3	2.5	2.5	2.5
30	4	2.2	2.5	2.4
40	4	2.8	3.0	2.9
50	5	2.2	2.5	2.4

40 mi/hr-TO-20 mi/hr COASTING TIMES

OPERATOR	DIRECTION	TIME, sec
R	A	19.8
R	B	19.6
D	A	22.1
D	B	19.9
	AVERAGE TIME	20.4

20 mi/hr-TO-40 mi/hr ACCELERATION TIMES

OPERATOR	DIRECTION	TIME, sec
R	A	5.6
R	B	5.4
D	A	5.5
D	B	5.4
	AVERAGE TIME	5.5

GEAR 3

DYNAMOMETER SIMULATION DATA

INERTIA WHEEL(S)	40-20 COASTING TIMES, sec RUN 1	RUN 2	RUN 3	CONSENSUS	20-40 ACCELERATION TIMES, sec RUN 1	RUN 2	RUN 3	CONSENSUS
5	11.1	11.6	—	11.4	4.0	—	—	4.0
2	18.2	19.5	20.5	19.4	5.5	5.5	—	5.5

INLET VACUUM, in Hg

SPEED, mi/hr	GEAR	LOAD = 0			LOAD = hp@ mi/hr			LOAD = hp@ mi/hr		
		RUN 1	RUN 2	AVG.	RUN 1	RUN 2	AVG.	RUN 1	RUN 2	AVG.
20	3	2.3	2.5	2.4						
30	4	2.4	2.3	2.4						
40	4	2.3	2.2	2.2						
50	5	1.7	1.8	1.8						

APPENDIX B

Shift Points Used for Motorcycle 7-Mode Tests and Motorcycle 7-Mode Emissions Data (1970 Federal Light-Duty Vehicle Procedure)

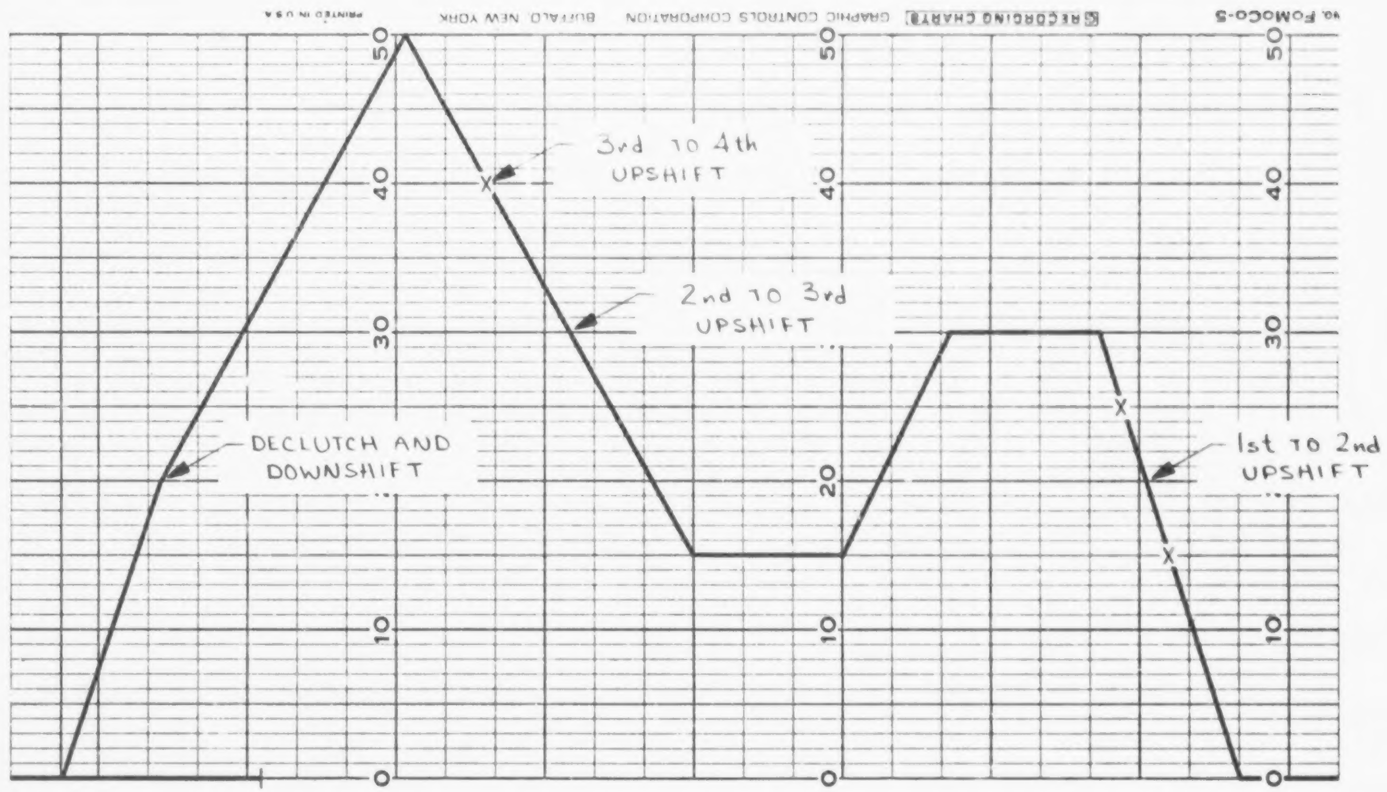

FIGURE B-1. ONE CYCLE OF THE FEDERAL 7-MODE EMISSIONS TEST PROCEDURE SHOWING SHIFT POINTS USED FOR TESTS OF THE SUZUKI T250-R, HARLEY-DAVIDSON FLH, AND TRIUMPH T120R MOTORCYCLES

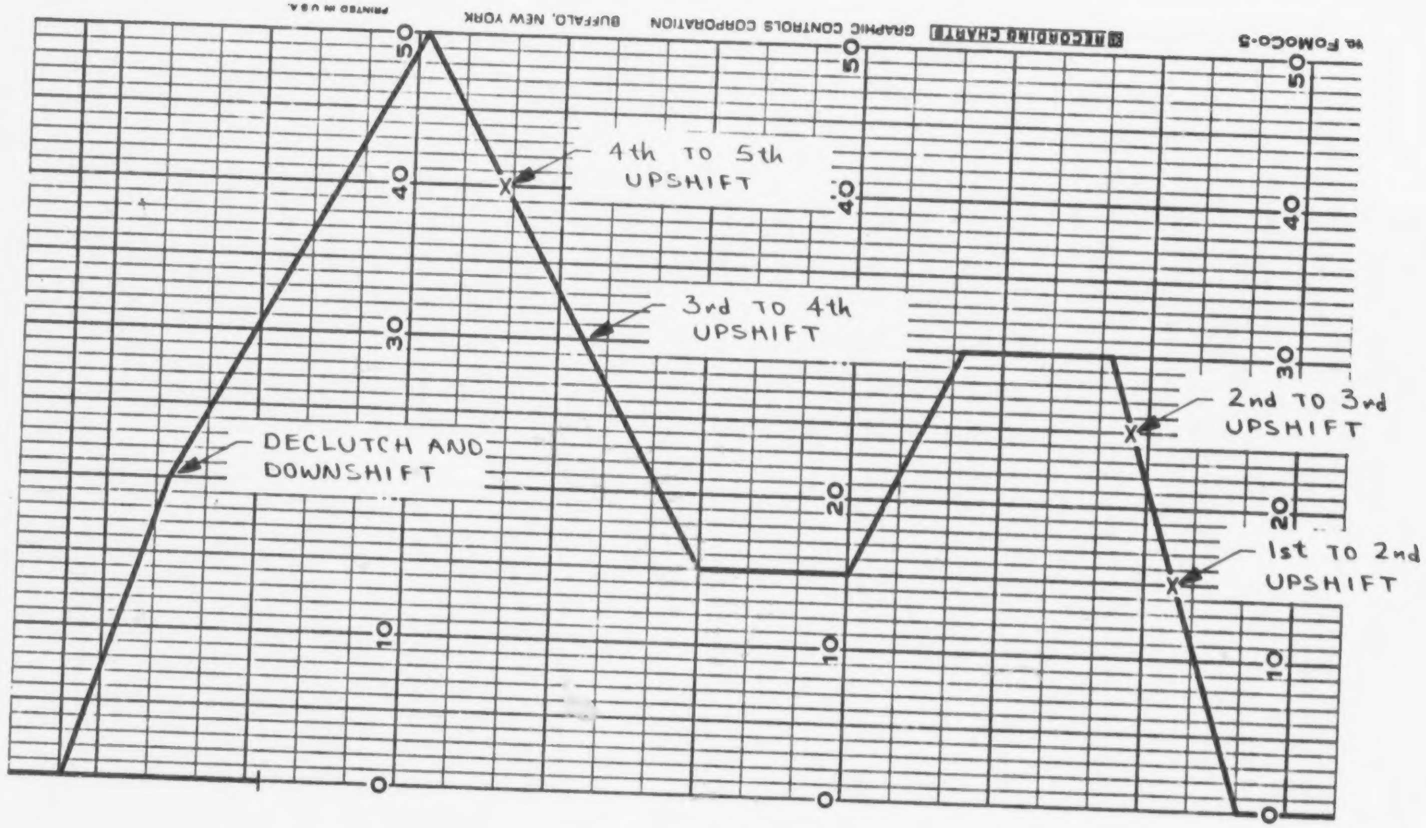

FIGURE B-2. ONE CYCLE OF THE FEDERAL 7-MODE EMISSIONS TEST PROCEDURE SHOWING SHIFT POINTS USED FOR TESTS OF THE HONDA CL350K3 MOTORCYCLE

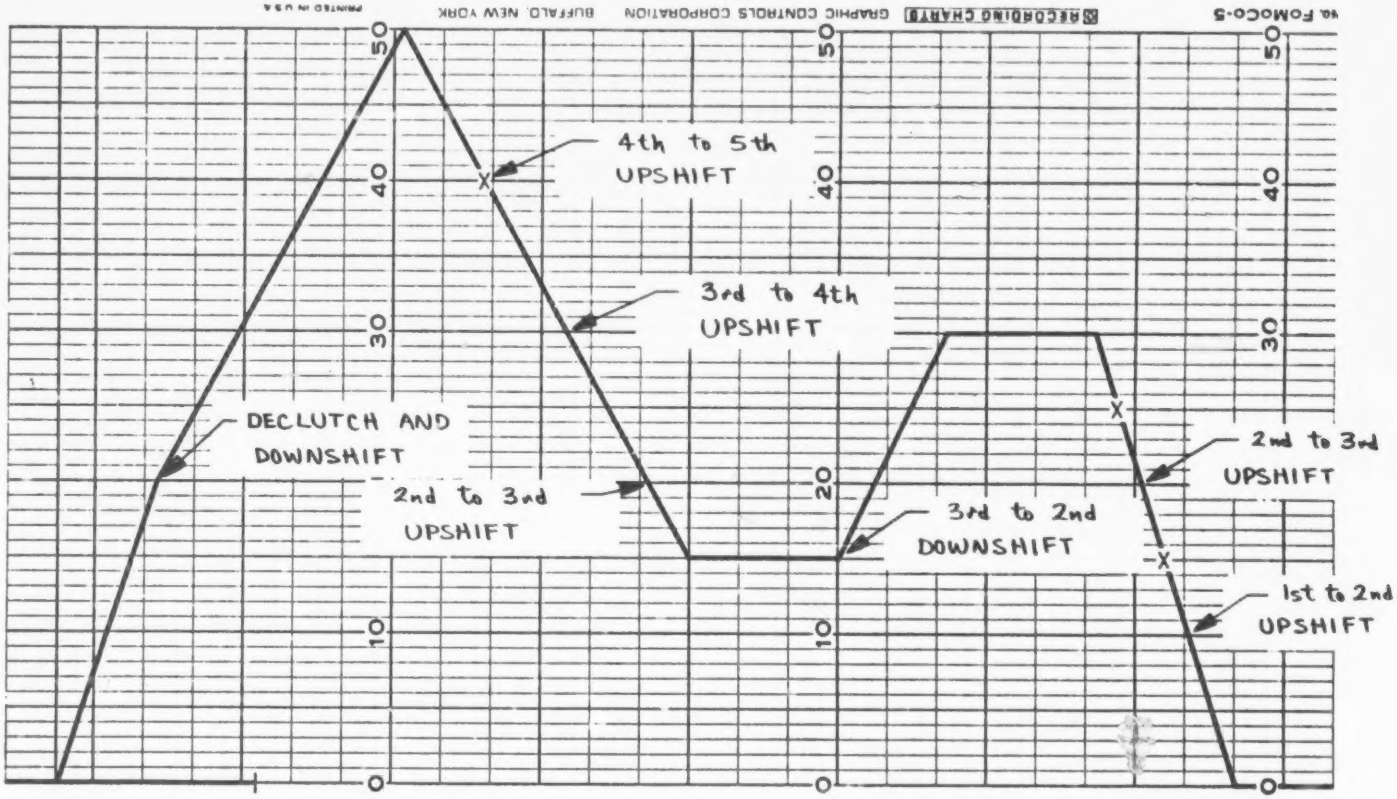

FIGURE B-3. ONE CYCLE OF THE FEDERAL 7-MODE EMISSIONS TEST PROCEDURE SHOWING SHIFT POINTS USED FOR TESTS OF THE HONDA SL-100 AND KAWASAKI 125 F-6 MOTORCYCLES

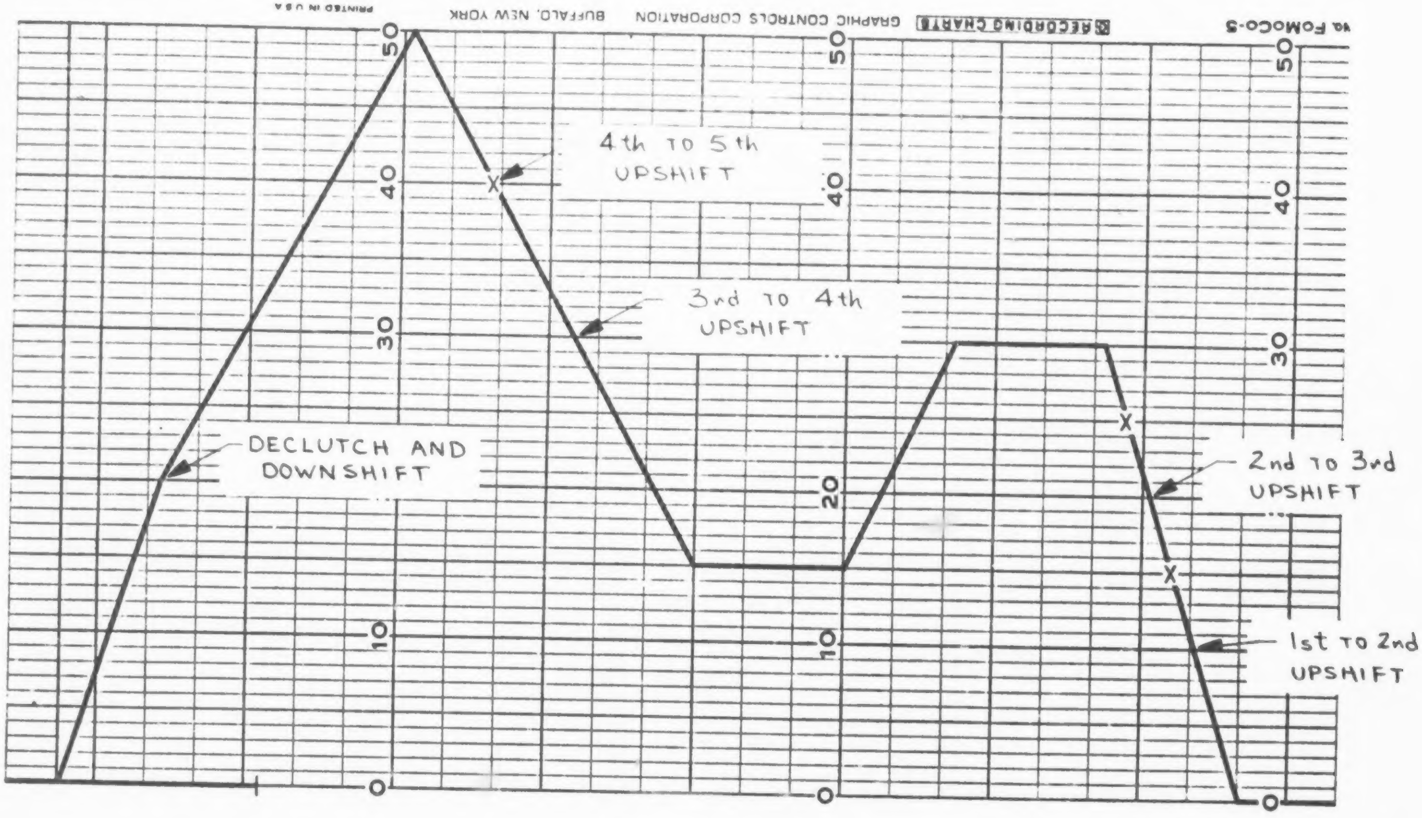

FIGURE B-4. ONE CYCLE OF THE FEDERAL 7-MODE EMISSIONS TEST PROCEDURE SHOWING SHIFT POINTS USED FOR TESTS OF THE YAMAHA DT1-E MOTORCYCLE

```
HARLEY            RUN   1                                  B - COLD CYCLE          K = 1.0000    W =    847.
-----------------------------------------------------------------------------------------------------------------
                 CONCENTRATION  AS  MEASURED   DILUTION      A D J U S T E D    WEIGHTING       W E I G H T E D
MODE               HC      CO    CO2    NO(K)    FACTOR      HC      CO   NO(K)    FACTOR       HC       CO      NO(K)
-----------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE           1818.  3.720   7.680    189.     1.260    2291.  4.689   238.     0.042      96.246  0.196     10.005
2 0-25           1374.  3.710   8.420    481.     1.253    1694.  4.574   593.     0.244     413.406  1.116    144.722
3 30              329.  3.550   8.720    247.     1.336     439.  4.744   330.     0.118      51.880  0.559     38.949
4 30-15          2810.  3.680   9.240    247.     1.027    2886.  3.780   25[illegible]     0.062     178.974  0.234     15.731
5 15             1674.  3.740   7.170    181.     1.336    2237.  4.999   241.     0.050     111.878  0.249     12.096
6 15-30          1100.  3.840   7.740    383.     1.336    1470.  5.132   511.     0.455     668.994  2.335    232.931
7 50-20          4814.  8.610   6.430    141.     1.079    5195.  3.896   152.     0.029     150.682  0.112      4.413
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------- 1672.062  4.805    458.851
**CYCLE 2**
1 IDLE           3306.  3.770   6.290     69.     1.234    4081.  4.654    85.     0.042     171.415  0.195      3.577
2 0-25           1704.  3.760   7.070    300.     1.343    2289.  5.052   403.     0.244     558.718  1.232     98.365
3 30              406.  3.720   9.150     93.     1.266     514.  4.711   117.     0.118      60.677  0.555     13.899
4 30-15          2798.  3.860   8.110     82.     1.110    3106.  4.285    91.     0.062     192.576  0.265      5.643
5 15             1516.  3.770   6.680     69.     1.421    2154.  5.358    98.     0.050     107.730  0.267      4.903
6 15-30          1064.  3.830   7.690    277.     1.348    1434.  5.164   373.     0.455     652.748  2.349    169.935
7 50-20          4298.  3.500   6.420    100.     1.131    4864.  3.961   113.     0.029     141.065  0.114      3.282
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------- 1884.932  4.982    299.607
**CYCLE 3**
1 IDLE           2632.  3.830   6.290     81.     1.312    3454.  5.026   106.     0.042     145.089  0.211      4.465
2 0-25           1587.  3.560   7.370    118.     1.334    2118.  4.751   157.     0.244     516.828  1.159     38.428
3 30              412.  3.880   7.580    101.     1.455     599.  5.645   146.     0.118      70.741  0.666     17.341
4 30-15          2814.  3.770   6.540     90.     1.264    3559.  4.768   113.     0.062     220.669  0.295      7.057
5 15             1302.  3.880   7.200     93.     1.374    1790.  5.334   127.     0.050      89.506  0.266      6.393
6 15-30           842.  3.860   8.070    115.     1.329    1119.  5.130   152.     0.455     509.204  2.334     69.546
7 50-20          3551.  3.760   5.900    111.     1.248    4432.  4.693   138.     0.029     128.556  0.136      4.018
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------- 1680.597  5.069    147.251
**CYCLE 4**
1 IDLE           2874.  3.830   6.200     93.     1.292    3714.  4.950   120.     0.042     156.010  0.207      5.048
2 0-25           1558.  3.870   7.320    163.     1.325    2065.  5.130   216.     0.244     503.966  1.251     52.725
3 30              397.  3.930   7.290     93.     1.497     594.  5.884   139.     0.118      70.144  0.694     16.431
4 30-15          2588.  3.470   6.350     85.     1.332    3449.  4.624   113.     0.062     213.842  0.286      7.023
5 15             1217.  3.880   7.070     93.     1.404    1709.  5.449   130.     0.050      85.460  0.272      6.530
6 15-30           803.  3.830   7.870    148.     1.361    1093.  5.213   201.     0.455     497.340  2.372     91.664
7 50-20          3236.  3.620   5.480    106.     1.344    4350.  4.866   142.     0.029     126.170  0.141      4.132
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------- 1652.935  5.226    183.557
AVERAGE SUM OF CYCLES 1-4 ------------------------------------------------------------ 1722.632  5.021    272.317
```

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HARLEY            RUN   1                                  B - COLD CYCLE          K = 1.0000    W =    847.
-----------------------------------------------------------------------------------------------------------------
                 CONCENTRATION  AS  MEASURED   DILUTION      A D J U S T E D    WEIGHTING       W E I G H T E D
MODE               HC      CO    CO2    NO(K)    FACTOR      HC      CO   NO(K)    FACTOR       HC       CO      NO(K)
-----------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE           2677.  3.830   5.950     69.     1.348    3608.  5.163    93.     0.042     151.568  0.216      3.906
2 0-25           1146.  3.830   6.670    242.     1.474    1689.  5.677   356.     0.244     412.354  1.385     87.076
3 30              485.  3.930   7.350     81.     1.473     714.  5.791   119.     0.118      84.343  0.683     14.086
4 30-15          2546.  3.830   5.110     69.     1.483    3776.  5.681   102.     0.062     234.161  0.352      6.346
5 15             1401.  3.880   7.140     69.     1.368    1917.  5.311    94.     0.050      95.885  0.265      4.722
6 15-30           891.  3.910   7.250    130.     1.426    1270.  5.576   185.     0.455     578.165  2.537     84.356
7 50-20          3726.  3.750   5.860    110.     1.233    4594.  4.624   135.     0.029     133.240  0.134      3.933
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------- 1689.718  5.574    204.427
**CYCLE 7**
1 IDLE           3556.  3.830   5.940     93.     1.239    4408.  4.748   115.     0.042     185.165  0.199      4.842
2 0-25           1685.  3.460   7.790    350.     1.278    2154.  4.424   447.     0.244     525.717  1.079    109.199
3 30              872.  3.930   7.490    105.     1.394    1216.  5.481   146.     0.118     143.505  0.646     17.279
4 30-15          3037.  3.810   6.040     93.     1.291    3923.  4.921   120.     0.062     243.231  0.305      7.448
5 15             1573.  3.880   7.490     93.     1.302    2049.  5.055   121.     0.050     102.474  0.252      6.058
6 15-30           939.  3.940   7.090    175.     1.439    1351.  5.670   251.     0.455     614.947  2.580    114.606
7 50-20          3918.  3.810   5.540     91.     1.241    4863.  4.731   113.     0.029     141.097  0.137      3.277
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------- 1956.139  5.201    262.712
AVERAGE SUM OF CYCLES 6-7 ------------------------------------------------------------ 1822.929  5.387    233.570

HARLEY            RUN   1                                  B - COLD CYCLE
-------------------------------------------------------------------------------------------
CYCLE       CONCENTRATION AS DETERMINED       WEIGHTING         W   E   I   G   H   T   E   D
NUMBER         HC          CO      NO(K)        FACTOR           HC          CO          NO(K)
-------------------------------------------------------------------------------------------
  1        1672.062     4.805    458.851       0.0875          146.305     0.420        40.149
  2        1884.932     4.982    299.607       0.0875          164.931     0.435        26.215
  3        1680.597     5.069    147.251       0.0875          147.052     0.443        12.884
  4        1652.935     5.226    183.557       0.0875          144.631     0.457        16.061
  6        1689.718     5.574    204.427       0.3250          549.158     1.811        66.439
  7        1956.139     5.201    262.712       0.3250          635.745     1.690        85.381
SUM--------------(TRIP COMPOSITE)---------------------------- 1787.825     5.259       247.131
```

```
DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
```

PETRO-CHEM
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```
HARLEY              RUN  2                                     - COLD CYCLE            K = 1.0000   W =    847.
-----------------------------------------------------------------------------------------------------------------
MODE           CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D   WEIGHTING         W E I G H T E D
                  HC      CO     CO2   NO(K)    FACTOR      HC      CO    NO(K)    FACTOR         HC       CO       NO(K)
-----------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE         1993.   6.390   7.710   105.     1.114     2179.   7.119   116.     0.042       91.390   0.299     4.913
2 0-25         1120.   6.600   9.130   190.     1.063     1190.   7.016   201.     0.244      290.518   1.711    49.284
3 30           1050.   5.990   7.950   166.     1.200     1260.   7.190   199.     0.118      148.733   0.848    23.514
4 30-15        3529.   5.620   7.660   149.     1.015     3583.   5.706   151.     0.062      222.148   0.353     9.379
5 15           1035.   7.660   8.500   117.     1.078     1115.   8.259   126.     0.050       55.799   0.412     6.307
6 15-30         868.   6.450   9.720   206.     1.044      906.   6.736   215.     0.455      412.508   3.065    97.899
7 50-20        4442.   6.560   6.030   139.     1.027     4565.   6.742   142.     0.029      132.403   0.195     4.143
SUM-----------(CYCLE COMPOSITE)---------------------------------------------------  1353.502   6.887   195.441
**CYCLE 2**
1 IDLE         2332.   7.880   7.110   117.     1.068     2492.   8.420   125.     0.042      104.667   0.353     5.251
2 0-25         1049.   8.010   8.310   144.     1.078     1131.   8.636   155.     0.244      275.980   2.107    37.884
3 30             55.   8.120   8.020   121.     1.194       65.   9.698   144.     0.118        7.752   1.144    17.054
4 30-15        3256.   7.260   6.930   127.     1.030     3353.   7.478   130.     0.062      207.945   0.463     8.110
5 15           1359.   8.410   7.980   117.     1.062     1443.   8.931   124.     0.050       72.166   0.446     6.213
6 15-30         723.   7.060   9.430   231.     1.055      762.   7.450   243.     0.455      347.139   3.389   110.911
7 50-20        3639.   7.610   6.290   134.     1.033     3762.   7.867   138.     0.029      109.104   0.228     4.017
SUM-----------(CYCLE COMPOSITE)---------------------------------------------------  1124.756   8.133   189.444
**CYCLE 3**
1 IDLE         2571.   8.110   6.740   117.     1.068     2746.   8.664   125.     0.042      115.368   0.363     5.250
2 0-25          960.   4.330  10.850   232.     1.031      990.   4.468   239.     0.244      241.711   1.090    58.413
3 30            346.   9.780   7.780   137.     1.111      384.  10.871   152.     0.118       45.386   1.282    17.970
4 30-15        2927.   7.810   6.470   114.     1.071     3135.   8.366   122.     0.062      194.395   0.518     7.571
5 15           1119.   8.350   7.850   121.     1.095     1226.   9.149   132.     0.050       61.304   0.457     6.628
6 15-30         695.   8.390   8.910   118.     1.046      727.   8.780   123.     0.455      330.932   3.994    56.187
7 50-20        3536.   7.900   6.060   131.     1.048     3707.   8.283   137.     0.029      107.520   0.240     3.983
SUM-----------(CYCLE COMPOSITE)---------------------------------------------------  1096.618   7.948   156.005
**CYCLE 4**
1 IDLE         2768.   8.040   6.800   129.     1.050     2906.   8.442   135.     0.042      122.069   0.354     5.688
2 0-25         1526.   8.160   8.450   133.     1.022     1560.   8.345   136.     0.244      380.798   2.036    33.188
3 30            351.   9.540   7.980   141.     1.104      387.  10.536   155.     0.118       45.742   1.243    18.375
4 30-15        2241.   8.290   7.120   143.     1.059     2374.   8.783   151.     0.062      147.213   0.544     9.393
5 15            951.   8.580   8.010   129.     1.088     1034.   9.335   140.     0.050       51.734   0.466     7.017
6 15-30         833.   8.890   7.650   124.     1.115      929.   9.919   138.     0.455      422.921   4.513    62.955
7 50-20        3971.   7.680   5.470   161.     1.066     4234.   8.189   171.     0.029      122.791   0.237     4.978
SUM-----------(CYCLE COMPOSITE)---------------------------------------------------  1293.272   9.396   141.598
AVERAGE SUM OF CYCLES 1-4 --------------------------------------------------------  1217.037   8.091   170.622
```

```
HARLEY              RUN  2                                     - COLD CYCLE            K = 1.0000   W =    847.
-----------------------------------------------------------------------------------------------------------------
MODE           CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D   WEIGHTING         W E I G H T E D
                  HC      CO     CO2   NO(K)    FACTOR      HC      CO    NO(K)    FACTOR         HC       CO       NO(K)
-----------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLF         3462.   7.850   6.320    69.     1.036     3589.   8.139    71.     0.042      150.769   0.341     3.004
2 0-25         1217.   8.100   8.790   138.     1.024     1246.   8.297   141.     0.244      304.199   2.024    34.494
3 30            295.  10.440   7.490    69.     1.112      328.  11.619    76.     0.118       38.704   1.371     9.061
4 30-15        2476.   8.430   6.700    74.     1.067     2641.   8.995    78.     0.062      163.802   0.557     4.895
5 15           1231.   8.870   7.550    81.     1.089     1340.   9.659    88.     0.050       67.030   0.482     4.410
6 15-30         722.   8.730   7.960   104.     1.106      798.   9.659   115.     0.455      363.485   4.395    52.358
7 50-20        2687.   8.210   6.670    87.     1.060     2848.   8.704    92.     0.029       82.612   0.252     2.674
SUM-----------(CYCLE COMPOSITE)---------------------------------------------------  1170.641   9.425   110.899
**CYCLE 7**
1 IDLE         3556.   7.750   6.470    81.     1.022     3634.   7.921    82.     0.042      152.663   0.332     3.477
2 0-25         1955.   6.470   8.530   448.     1.044     2042.   6.760   468.     0.244      498.457   1.649   114.224
3 30             54.   8.520   8.610   129.     1.121       60.   9.555   144.     0.118        7.146   1.127    17.072
4 30-15        3079.   7.800   6.520    88.     1.054     3248.   8.228    92.     0.062      201.379   0.510     5.755
5 15           1231.   8.870   7.640    93.     1.081     1331.   9.594   100.     0.050       66.580   0.479     5.030
6 15-30         792.   8.970   8.390   119.     1.056      836.   9.472   125.     0.455      380.559   4.310    57.180
7 50-20        3925.   7.940   6.230   105.     1.004     3941.   7.973   105.     0.029      114.305   0.231     3.057
SUM-----------(CYCLE COMPOSITE)---------------------------------------------------  1421.092   8.641   205.797
AVERAGE SUM OF CYCLES 6-7 --------------------------------------------------------  1295.866   9.033   158.348
```

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HARLEY              RUN  2                                     - COLD CYCLE
-----------------------------------------------------------------------------------
CYCLE         CONCENTRATION AS DETERMINED        WEIGHTING         W   E   I   G   H   T   E   D
NUMBER           HC          CO         NO(K)       FACTOR         HC           CO          NO(K)
-----------------------------------------------------------------------------------
  1          1353.502     6.887     195.441      0.0875        118.431      0.602       17.101
  2          1124.756     8.133     189.444      0.0875         98.416      0.711       16.576
  3          1096.618     7.948     156.005      0.0875         95.954      0.695       13.650
  4          1293.272     9.396     141.598      0.0875        113.161      0.822       12.389
  6          1170.641     9.425     110.899      0.3250        380.458      3.063       36.042
  7          1421.092     8.641     205.797      0.3250        461.854      2.808       66.884
SUM-----------(TRIP COMPOSITE)-----------------------------  1268.276      8.703      162.644
```

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)

```
HARLEY              RUN  3                                          - COLD CYCLE              K = 1.0000   W =   847.
---------------------------------------------------------------------------------------------------------------------
              CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D  WEIGHTING          W E I G H T E D
MODE            HC      CO     CO2    NO(K)    FACTOR      HC      CO   NO(K)   FACTOR         HC       CO        NO(K)
---------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE        3463.  6.710   7.200     93.     1.014     3512.  6.806    94.     0.042     147.531   0.285       3.962
2 0-25        1314.  6.650   9.690    218.     1.004     1319.  6.680   218.     0.244     322.079   1.630      53.434
3 30           138.  6.880  10.150    141.     1.055      145.  7.261   148.     0.118      17.185   0.856      17.559
4 30-15       3697.  6.680   6.890    102.     1.019     3769.  6.810   103.     0.062     233.681   0.422       6.447
5 15          1317.  8.080   8.670    117.     1.026     1351.  8.290   120.     0.050      67.563   0.414       6.002
6 15-30        820.  6.680  10.610    295.     0.977      801.  6.528   288.     0.455     364.660   2.970     131.188
7 50-20       4769.  7.170   5.970    116.     0.986     4702.  7.069   114.     0.029     136.368   0.205       3.316
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------- 1289.069   6.785     221.911
**CYCLE 2**
1 IDLE        3182.  8.210   6.470    105.     1.034     3292.  8.496   108.     0.042     138.302   0.356       4.563
2 0-25        1848.  9.400   7.600    217.     1.014     1874.  9.534   220.     0.244     457.351   2.326      53.704
3 30           231.  9.090   8.820    117.     1.065      246.  9.681   124.     0.118      29.030   1.142      14.703
4 30-15       2688.  8.350   7.480     97.     0.996     2677.  8.316    96.     0.062     165.991   0.515       5.990
5 15          1345.  8.870   7.880    113.     1.053     1416.  9.341   119.     0.050      70.827   0.467       5.950
6 15-30        807.  9.140   8.520    271.     1.038      838.  9.492   281.     0.455     381.345   4.319     128.060
7 50-20       3353.  7.530   7.000    117.     1.007     3379.  7.589   117.     0.029      98.005   0.220       3.419
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------- 1340.856   9.347     216.392
**CYCLE 3**
1 IDLE        2723.  8.410   6.560    105.     1.057     2880.  8.897   111.     0.042     120.992   0.273       4.665
2 0-25        1731.  8.010   8.570    208.     1.003     1737.  8.040   208.     0.244     423.987   1.961      50.947
3 30            28.  9.540   8.390    117.     1.099       30. 10.487   128.     0.118       3.632   1.237      15.176
4 30-15       2839.  8.310   6.600    108.     1.049     2978.  8.718   113.     0.062     184.663   0.540       7.024
5 15          1231.  8.590 [illegible].180    113.     1.050     1293.  9.022   118.     0.050      64.651   0.451       5.934
6 15-30        833.  8.730   8.680    108.     1.039      866.  9.077   112.     0.455     394.109   4.130      51.097
7 50-20       3133.  8.240   6.250    125.     1.054     3303.  8.687   131.     0.029      95.787   0.251       3.821
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------- 1287.824   8.947     138.667
**CYCLE 4**
1 IDLE        2935.  8.550   6.560    117.     1.035     3038.  8.852   121.     0.042     127.628   0.371       5.087
2 0-25        1674.  8.610   8.570    184.     0.987     1653.  8.502   181.     0.244     403.367   2.074      44.336
3 30           770. 10.400   7.780    129.     1.049      808. 10.918   135.     0.118      95.388   1.288      15.980
4 30-15       2078.  8.140   6.680    111.     1.115     2318.  9.083   123.     0.062     143.765   0.563       7.679
5 15          1601.  9.200   7.290    117.     1.064     1704.  9.795   124.     0.050      85.227   0.489       6.228
6 15-30        914.  8.540   8.880    212.     1.025      937.  8.759   217.     0.455     426.544   3.985      98.935
7 50-20       2649.  8.250   6.180    117.     1.101     2917.  9.085   128.     0.029      84.605   0.263       3.736
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------- 1366.528   9.036     181.985
AVERAGE SUM OF CYCLES 1-4 -------------------------------------------------------------- 1321.069   8.529     189.739
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PETRO-CHEM COMPUTING INC

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HARLEY              RUN  3                                          - COLD CYCLE              K = 1.0000   W =   847.
---------------------------------------------------------------------------------------------------------------------
              CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D  WEIGHTING          W E I G H T E D
MODE            HC      CO     CO2    NO(K)    FACTOR      HC      CO   NO(K)   FACTOR         HC       CO        NO(K)
---------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE        3682.  7.850   6.030     57.     1.040     3832.  8.170    59.     0.042     160.953   0.343       2.491
2 0-25        1743.  6.900   9.460    195.     0.980     1708.  6.763   191.     0.244     416.884   1.650      46.639
3 30           716. 10.660   7.390     81.     1.074      769. 11.455    87.     0.118      90.791   1.351      10.271
4 30-15       2593.  8.290   5.940     63.     1.125     2917.  9.328    70.     0.062     180.910   0.578       4.395
5 15          1515.  9.200   7.200    105.     1.079     1634.  9.928   113.     0.050      81.747   0.496       5.665
6 15-30        842.  7.970   9.100    144.     1.036      872.  8.257   149.     0.455     396.952   3.757      67.887
7 50-20       3512.  8.370   5.930     98.     1.042     3661.  8.726   102.     0.029     106.183   0.253       2.962
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------- 1434.423   8.430     140.313
**CYCLE 7**
1 IDLE        3587.  8.140   6.260     93.     1.020     3661.  8.309    94.     0.042     153.793   0.349       3.987
2 0-25        1488.  8.500   7.670    104.     1.071     1595.  9.111   111.     0.244     389.186   2.223      27.201
3 30           867. 10.400   7.490    105.     1.064      922. 11.066   111.     0.118     108.865   1.305      13.184
4 30-15       2992.  8.110   6.240     98.     1.071     3207.  8.693   105.     0.062     198.856   0.539       6.513
5 15           288.  9.090   7.680    117.     1.156      333. 10.514   135.     0.050      16.655   0.525       6.766
6 15-30       1150.  9.430   8.270    108.     1.019     1172.  9.610   110.     0.455     533.290   4.372      50.082
7 50-20       3139.  8.500   6.090    125.     1.056     3315.  8.976   132.     0.029      96.135   0.260       3.828
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------- 1496.784   9.576     111.564
AVERAGE SUM OF CYCLES 6-7 -------------------------------------------------------------- 1465.603   9.003     125.938

HARLEY              RUN  3                                          - COLD CYCLE
------------------------------------------------------------------------------------
CYCLE       CONCENTRATION AS DETERMINED        WEIGHTING           W  E  I  G  H  T  E  D
NUMBER         HC           CO         NO(K)      FACTOR              HC         CO          NO(K)
------------------------------------------------------------------------------------
   1        1289.069      6.785      221.911      0.0875           112.793     0.593      19.417
   2        1340.856      9.347      216.392      0.0875           117.324     0.817      18.934
   3        1287.824      8.947      138.667      0.0875           112.684     0.782      12.133
   4        1366.528      9.036      181.985      0.0875           119.571     0.790      15.923
   6        1434.423      8.430      140.313      0.3250           466.187     2.739      45.601
   7        1496.784      9.576      111.564      0.3250           486.454     3.112      36.258
SUM-----------(TRIP COMPOSITE)--------------------------------- 1415.016     8.837     148.269
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DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
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PETRO-CHEM COMPUTING INC

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HARLEY-DAVIDSON FLH RUN  4                                 S - COLD CYCLE          K = 1.0000   W =   847.
------------------------------------------------------------------------------------------------------------
            CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D   WEIGHTING       W E I G H T E D
MODE           HC      CO   CO2     NO(K)    FACTOR      HC      CO   NO(K)    FACTOR         HC      CO       NO(K)
------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE       2516.  7.960  6.970     77.     1.060     2669.  8.444    81.     0.042      112.110  0.354      3.431
2 0-25       1832.  5.810  8.660     84.     1.070     1961.  6.220    89.     0.244      478.575  1.517     21.943
3 30          387.  5.580  9.580    201.     1.133      438.  6.327   227.     0.118       51.779  0.746     26.893
4 30-15      2749.  5.640  8.050    273.     1.047     2880.  5.909   286.     0.062      178.579  0.366     17.734
5 15         1981.  7.740  8.430     90.     1.004     1989.  7.772    90.     0.050       99.465  0.388      4.518
6 15-30      1336.  7.190  9.260    106.     1.014     1354.  7.291   107.     0.455      616.473  3.317     48.911
7 50-20      4550.  6.640  5.910    262.     1.025     4664.  6.807   268.     0.029      135.271  0.197      7.789
SUM-----------(CYCLE COMPOSITE)----------------------------------------------------- 1672.254  6.889    131.222
**CYCLE 2**
1 IDLE       1922.  9.060  7.460    103.     1.030     1981.  9.339   106.     0.042       83.216  0.392      4.459
2 0-25       1612.  8.460  8.540    255.     0.999     1610.  8.453   254.     0.244      393.030  2.062     62.173
3 30          281.  9.590  8.630    129.     1.056      296. 10.128   136.     0.118       35.021  1.195     16.077
4 30-15      1479.  7.910  7.390    114.     1.124     1663.  8.783   128.     0.062      103.132  0.544      7.949
5 15         2455.  9.320  8.040    112.     0.944     2318.  8.803   105.     0.050      115.942  0.440      5.289
6 15-30       149.  8.610  8.770    183.     1.095      163.  9.432   200.     0.455       74.269  4.291     91.217
7 50-20      3617.  7.770  6.050    124.     1.047     3789.  8.139   129.     0.029      109.884  0.236      3.767
SUM-----------(CYCLE COMPOSITE)-----------------------------------------------------  914.497  9.162    190.933
**CYCLE 3**
1 IDLE       2365.  9.500  6.640    103.     1.039     2459.  9.878   107.     0.042      103.289  0.414      4.498
2 0-25       1966.  9.650  7.540    156.     1.000     1967.  9.657   156.     0.244      480.092  2.356     38.094
3 30          909. 11.200  7.650     99.     1.018      926. 11.411   100.     0.118      109.283  1.346     11.902
4 30-15      1176. 10.230  7.070     99.     1.077     1267. 11.024   106.     0.062       78.574  0.683      6.614
5 15         1588.  9.920  7.720    103.     1.007     1599.  9.992   103.     0.050       79.978  0.499      5.187
6 15-30      1119.  8.720  8.620    343.     1.021     1143.  8.911   350.     0.455      520.322  4.054    159.491
7 50-20      3014.  8.080  6.650    133.     1.039     3133.  8.401   138.     0.029       90.883  0.243      4.010
SUM-----------(CYCLE COMPOSITE)----------------------------------------------------- 1462.424  9.599    229.799
**CYCLE 4**
1 IDLE       2231.  9.280  6.820    103.     1.045     2332.  9.701   107.     0.042       97.961  0.407      4.522
2 0-25       1877.  9.250  7.670    222.     1.012     1900.  9.364   224.     0.244      463.674  2.285     54.840
3 30          207. 10.410  8.140    129.     1.068      221. 11.124   137.     0.118       26.102  1.312     16.266
4 30-15      1630.  8.880  6.910    114.     1.105     1802.  9.821   126.     0.062      111.771  0.608      7.817
5 15         1878. 10.030  7.750    117.     0.980     1840.  9.831   114.     0.050       92.038  0.491      5.734
6 15-30       230.  8.270  8.460    287.     1.128      259.  9.336   324.     0.455      118.148  4.248    147.428
7 50-20      3272.  7.830  6.230    141.     1.060     3468.  8.300   149.     0.029      100.584  0.240      4.334
SUM-----------(CYCLE COMPOSITE)----------------------------------------------------- 1010.282  9.594    240.944
AVERAGE SUM OF CYCLES 1-4 ---------------------------------------------------------- 1264.864  8.811    198.224
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PETRO-CHEM COMPUTING INC

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HARLEY-DAVIDSON FLH RUN  4                                 S - COLD CYCLE          K = 1.0000   W =   847.
------------------------------------------------------------------------------------------------------------
            CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D   WEIGHTING       W E I G H T E D
MODE           HC      CO   CO2     NO(K)    FACTOR      HC      CO   NO(K)    FACTOR         HC      CO       NO(K)
------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE       1995.  9.390  6.210    103.     1.110     2215. 10.425   114.     0.042       93.031  0.437      4.803
2 0-25       1863.  9.240  7.540    185.     1.023     1906.  9.453   189.     0.244      465.091  2.306     46.184
3 30          392. 10.560  7.650    129.     1.085      425. 11.466   140.     0.118       50.227  1.353     16.529
4 30-15      1583.  8.680  6.710    126.     1.136     1798.  9.863   143.     0.062      111.532  0.611      8.877
5 15         2322. 10.220  7.560    117.     0.955     2218.  9.763   111.     0.050      110.915  0.488      5.588
6 15-30        97.  9.140  8.390    187.     1.109      107. 10.144   207.     0.455       48.983  4.615     94.432
7 50-20      3761.  7.490  5.820    169.     1.064     4001.  7.969   179.     0.029      116.057  0.231      5.215
SUM-----------(CYCLE COMPOSITE)-----------------------------------------------------  995.840 10.044    181.630
**CYCLE 7**
1 IDLE       2865.  9.500  6.410    129.     1.017     2914.  9.663   131.     0.042      122.404  0.405      5.511
2 0-25       2413.  9.960  7.110    195.     0.986     2380.  9.827   192.     0.244      580.917  2.397     46.945
3 30         1105. 10.520  7.850    117.     1.013     1120. 10.664   118.     0.118      132.182  1.258     13.995
4 30-15      1566.  8.860  6.810    137.     1.121     1755.  9.934   153.     0.062      108.870  0.615      9.524
5 15         2683.  9.910  7.870    129.     0.922     2474.  9.139   118.     0.050      123.718  0.456      5.908
6 15-30        87.  8.590  8.[illegible]    383.     1.111       96.  9.545   425.     0.455       43.986  4.343    193.643
7 50-20      3797.  7.740  5.650    145.     1.064     4042.  8.239   154.     0.029      117.220  0.238      4.476
SUM-----------(CYCLE COMPOSITE)----------------------------------------------------- 1229.301  9.717    280.044
AVERAGE SUM OF CYCLES 6-7 ---------------------------------------------------------- 1112.570  9.880    230.837
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HARLEY-DAVIDSON FLH RUN  4                                 S - COLD CYCLE
------------------------------------------------------------------------------
CYCLE        CONCENTRATION AS DETERMINED        WEIGHTING        W E I G H T E D
NUMBER          HC          CO        NO(K)       FACTOR         HC        CO       NO(K)
------------------------------------------------------------------------------
  1          1672.254     6.889    131.222       0.0875       146.322   0.602     11.481
  2           914.497     9.162    190.933       0.0875        80.018   0.801     16.706
  3          1462.424     9.599    229.799       0.0875       127.962   0.839     20.107
  4          1010.282     9.594    240.944       0.0875        88.399   0.839     21.082
  6           995.840    10.044    181.630       0.3250       323.648   3.264     59.029
  7          1229.301     9.717    280.044       0.3250       399.522   3.158     91.014
SUM-----------(TRIP COMPOSITE)---------------------------- 1163.873   9.506    219.423
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PETRO-CHEM COMPUTING INC

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)

HARLEY DAVIDSON FLH RUN 5 S - COLD CYCLE K = 1.0000 W = 847.

MODE	CONCENTRATION AS HC	CO	CO2	MEASURED NO(K)	DILUTION FACTOR	ADJUSTED HC	CO	NO(K)	WEIGHT FACTOR	WEIGHTED HC	CO	NO(K)
CYCLE 1												
1 IDLE	1791.	8.690	7.410	77.	1.067	1911.	9.058	82.	0.042	80.263	0.380	3.450
2 0-25	1323.	5.970	9.520	284.	1.040	1376.	6.212	295.	0.244	335.928	1.515	72.111
3 30	465.	7.020	9.370	143.	1.083	503.	7.606	154.	0.118	59.453	0.897	18.283
4 30-15	2034.	5.280	7.540	149.	1.171	2382.	6.185	174.	0.062	147.742	0.383	10.822
5 15	2114.	8.110	8.340	116.	0.987	2088.	8.011	114.	0.050	104.417	0.400	5.729
6 15-30	224.	6.650	9.440	309.	1.114	249.	7.413	344.	0.455	113.619	3.373	156.734
7 50-20	3912.	5.280	6.180	128.	1.111	4348.	5.868	142.	0.029	126.102	0.170	4.126
SUM------------(CYCLE COMPOSITE)										967.526	7.121	271.258
CYCLE 2												
1 IDLE	2546.	7.910	7.000	90.	1.058	2693.	8.369	95.	0.042	113.137	0.351	3.999
2 0-25	2250.	6.440	9.060	274.	0.985	2217.	6.348	270.	0.244	541.162	1.548	65.901
3 30	266.	8.950	8.750	117.	1.073	285.	9.604	125.	0.118	33.682	1.133	14.815
4 30-15	1439.	7.490	7.860	105.	1.102	1981.	8.255	115.	0.062	98.068	0.511	7.175
5 15	2276.	8.530	8.480	117.	0.953	2170.	8.135	111.	0.050	108.537	0.406	5.579
6 15-30	1356.	7.010	9.420	283.	1.007	1366.	7.063	285.	0.455	621.718	3.214	129.753
7 50-20	3167.	7.000	6.580	133.	1.074	3401.	7.518	142.	0.029	98.643	0.218	4.142
SUM------------(CYCLE COMPOSITE)										1614.949	7.384	231.367
CYCLE 3												
1 IDLE	2172.	8.950	7.090	103.	1.042	2264.	9.329	107.	0.042	95.088	0.391	4.509
2 0-25	1809.	8.440	8.030	200.	1.020	1846.	8.616	204.	0.244	450.603	2.102	49.817
3 30	189.	9.500	8.480	130.	1.079	203.	10.253	140.	0.118	24.071	1.209	16.557
4 30-15	1302.	7.900	7.140	109.	1.160	1510.	9.166	126.	0.062	93.668	0.568	7.841
5 15	1878.	8.840	8.190	90.	0.990	1860.	8.756	89.	0.050	93.013	0.437	4.457
6 15-30	1521.	8.020	8.620	184.	1.015	1545.	8.147	186.	0.455	703.077	3.707	85.053
7 50-20	3093.	7.460	6.460	150.	1.071	3314.	7.994	160.	0.029	96.124	0.231	4.661
SUM------------(CYCLE COMPOSITE)										1555.646	8.649	172.898
CYCLE 4												
1 IDLE	2957.	8.630	6.730	103.	1.018	3011.	8.788	104.	0.042	126.474	0.369	4.405
2 0-25	2293.	8.720	7.610	231.	1.003	2301.	8.752	231.	0.244	561.566	2.135	56.572
3 30	281.	9.130	8.070	157.	1.120	314.	10.231	175.	0.118	37.159	1.207	20.761
4 30-15	1552.	7.960	7.230	125.	1.125	1746.	8.956	140.	0.062	108.274	0.555	8.720
5 15	2381.	8.630	8.480	130.	0.943	2246.	8.143	122.	0.050	112.337	0.407	6.133
6 15-30	359.	8.150	8.560	354.	1.113	399.	9.074	394.	0.455	181.874	4.128	179.341
7 50-20	2102.	7.270	6.560	160.	1.163	2445.	8.456	186.	0.029	70.908	0.245	5.397
SUM------------(CYCLE COMPOSITE)										1198.595	9.048	281.333
AVERAGE SUM OF CYCLES 1-4										1334.179	8.050	239.214

HARLEY DAVIDSON FLH RUN 5 S - COLD CYCLE K = 1.0000 W = 847.

MODE	CONCENTRATION AS HC	CO	CO2	MEASURED NO(K)	DILUTION FACTOR	ADJUSTED HC	CO	NO(K)	WEIGHTING FACTOR	WEIGHTED HC	CO	NO(K)
CYCLE 6												
1 IDLE	2410.	8.740	6.210	130.	1.099	2650.	9.613	142.	0.042	111.333	0.403	6.005
2 0-25	2354.	8.870	6.760	246.	1.055	2484.	9.362	259.	0.244	606.264	2.284	63.356
3 30	606.	9.780	8.040	157.	1.067	646.	10.439	167.	0.118	76.327	1.231	19.774
4 30-15	1264.	8.500	6.740	148.	1.173	1483.	9.975	173.	0.062	91.972	0.618	10.768
5 15	2010.	8.630	8.040	143.	0.998	2006.	8.614	142.	0.050	100.321	0.430	7.137
6 15-30	511.	8.440	7.950	358.	1.139	582.	9.619	408.	0.455	265.001	4.376	185.656
7 50-20	2009.	7.150	6.360	195.	1.197	2406.	8.564	233.	0.029	69.789	0.248	6.774
SUM------------(CYCLE COMPOSITE)										1321.011	9.594	299.473
CYCLE 7												
1 IDLE	3173.	7.810	5.960	143.	1.090	3461.	8.519	155.	0.042	145.379	0.357	6.551
2 0-25	213.	8.740	6.910	230.	1.259	268.	11.010	289.	0.244	65.472	2.686	70.698
3 30	225.	10.030	7.940	170.	1.098	247.	11.019	186.	0.118	29.169	1.300	22.038
4 30-15	1495.	8.170	6.630	161.	1.176	1758.	9.608	189.	0.062	109.006	0.595	11.739
5 15	2804.	9.280	7.180	157.	0.976	2738.	9.062	153.	0.050	136.911	0.453	7.665
6 15-30	214.	8.840	8.120	272.	1.135	242.	10.036	308.	0.455	110.551	4.566	140.513
7 50-20	2407.	6.560	5.830	211.	1.238	2980.	8.123	261.	0.029	86.437	0.235	7.577
SUM------------(CYCLE COMPOSITE)										682.927	10.195	266.785
AVERAGE SUM OF CYCLES 6-7										1001.969	9.895	283.129

HARLEY DAVIDSON FLH RUN 5 S - COLD CYCLE

CYCLE NUMBER	CONCENTRATION AS DETERMINED HC	CO	NO(K)	WEIGHTING FACTOR	WEIGHTED HC	CO	NO(K)
1	967.526	7.121	271.258	0.0875	84.658	0.623	23.735
2	1614.949	7.384	231.367	0.0875	141.308	0.646	20.244
3	1555.646	8.649	172.898	0.0875	136.119	0.756	15.128
4	1198.595	9.048	281.333	0.0875	104.877	0.791	24.616
6	1321.011	9.594	299.473	0.3250	429.328	3.118	97.328
7	682.927	10.195	266.785	0.3250	221.951	3.313	86.705
SUM------------(TRIP COMPOSITE)					1118.263	9.249	267.759

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)

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          HONDA CL350K3         RUN-1                               B - COLD CYCLE              K = 1.0000    W =    505.
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                CONCENTRATION  AS  MEASURED  DILUTION       A D J U S T E D   WEIGHTING          W E I G H T E D
MODE               HC      CO     CO2     NO(K)    FACTOR       HC       CO   NO(K)    FACTOR           HC        CO          NO(K)
--------------------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE            354.   2.810   4.800     46.     2.201       779.   6.185   101.     0.042        32.727    0.259        4.252
2 0-25            430.   4.690   5.220    102.     1.805       776.   8.469   184.     0.244       189.471    2.066       44.944
3 30              332.   2.390   7.580    214.     1.587       527.   3.794   339.     0.118        62.193    0.447       40.088
4 30-15           790.   3.150   3.990     58.     2.259      1784.   7.116   131.     0.062       110.655    0.441        8.124
5 15              387.   4.170   4.040     46.     2.216       857.   9.241   101.     0.050        42.881    0.462        5.097
6 15-30           443.   5.240   4.890    117.     1.815       804.   9.511   212.     0.455       365.865    4.327       96.628
7 50-20          2277.   1.590   1.520     57.     3.037      6915.   4.829   173.     0.029       200.554    0.140        5.020
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------------- 1004.349    8.145      204.155
**CYCLE 2**
1 IDLE            555.   1.620   4.210     35.     2.580      1432.   4.180    90.     0.042        60.147    0.175        3.793
2 0-25            561.   5.360   4.390     84.     1.889      1059.  10.125   158.     0.244       258.578    2.470       38.717
3 30              463.   6.490   4.090     46.     1.850       856.  12.010    85.     0.118       101.108    1.417       10.045
4 30-15          1936.   2.050   1.480     30.     3.154      6108.   6.467    94.     0.062       378.700    0.401        5.868
5 15              272.   2.600   4.180     50.     2.511       683.   6.529   125.     0.050        34.154    0.326        6.278
6 15-30           387.   5.560   4.470     85.     1.890       731.  10.513   160.     0.455       332.974    4.783       73.133
7 50-20          1887.   1.540   1.810     66.     3.139      5925.   4.835   207.     0.029       171.825    0.140        6.009
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------------- 1337.490    9.714      143.846
**CYCLE 3**
1 IDLE            379.   2.530   3.700     35.     2.698      1022.   6.825    94.     0.042        42.947    0.286        3.966
2 0-25            493.   5.630   4.250    104.     1.908       940.  10.745   198.     0.244       229.581    2.621       48.431
3 30              571.   7.130   3.620     42.     1.858      1061.  13.251    78.     0.118       125.227    1.563        9.211
4 30-15          1921.   1.870   1.370     37.     3.310      6359.   6.191   122.     0.062       394.316    0.383        7.594
5 15              300.   3.220   4.280     57.     2.333       700.   7.513   133.     0.050        35.001    0.375        6.650
6 15-30           470.   6.170   4.040     76.     1.899       892.  11.721   144.     0.455       406.260    5.333       65.693
7 50-20          1805.   1.470   1.710     66.     3.299      5955.   4.850   217.     0.029       172.720    0.140        6.315
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------------- 1406.054   10.705      147.862
**CYCLE 4**
1 IDLE            405.   3.020   3.060     35.     2.895      1172.   8.745   101.     0.042        49.256    0.367        4.256
2 0-25            469.   5.440   4.060     82.     1.989       933.  10.829   163.     0.244       227.724    2.641       39.815
3 30              704.   7.040   3.400     46.     1.887      1329.  13.291    86.     0.118       156.835    1.568       10.247
4 30-15          1777.   2.480   1.490     35.     3.118      5542.   7.734   109.     0.062       343.615    0.479        6.767
5 15              235.   2.590   4.480     57.     2.405       565.   6.229   137.     0.050        28.260    0.311        6.854
6 15-30           756.   5.780   4.100     73.     1.857      1404.  10.735   135.     0.455       638.919    4.884       61.694
7 50-20          1795.   1.480   1.840     53.     3.208      5760.   4.749   170.     0.029       167.042    0.137        4.932
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------------- 1611.653   10.390      134.569
AVERAGE SUM OF CYCLES 1-4 -------------------------------------------------------------------- 1339.887    9.739      157.608
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PETRO CHEM COMPUTING INC

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          HONDA CL350K3         RUN-1                               B - COLD CYCLE              K = 1.0000    W =    505.
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                CONCENTRATION  AS  MEASURED  DILUTION       A D J U S T E D   WEIGHTING          W E I G H T E D
MODE               HC      CO     CO2     NO(K)    FACTOR       HC       CO   NO(K)    FACTOR           HC        CO          NO(K)
--------------------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE             57.   3.020   3.030     34.     3.151       179.   9.516   107.     0.042         7.543    0.399        4.499
2 0-25            838.   5.010   4.200    194.     1.905      1596.   9.545   369.     0.244       389.596    2.329       90.192
3 30              704.   7.130   3.280     46.     1.906      1342.  13.593    87.     0.118       158.381    1.604       10.348
4 30-15          1701.   3.340   1.600     34.     2.839      4829.   9.482    96.     0.062       299.427    0.587        5.985
5 15              757.   3.930   5.490     46.     1.752      1326.   6.888    80.     0.050        66.342    0.344        4.031
6 15-30           437.   5.770   3.940     77.     1.987       868.  11.465   153.     0.455       395.110    5.216       69.619
7 50-20          1701.   1.370   1.640     85.     3.483      5926.   4.772   296.     0.029       171.854    0.138        8.587
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------------- 1488.256   10.620      193.264
**CYCLE 7**
1 IDLE            457.   3.000   3.230     34.     2.775      1268.   8.327    94.     0.042        53.280    0.349        3.963
2 0-25            509.   5.650   4.030     94.     1.958       996.  11.063   184.     0.244       243.201    2.699       44.913
3 30              680.   6.980   3.340     46.     1.916      1303.  13.379    88.     0.118       153.809    1.578       10.404
4 30-15          1679.   2.130   1.440     34.     3.357      5637.   7.152   114.     0.062       349.538    0.443        7.078
5 15              231.   2.090   4.830     69.     2.367       546.   4.948   163.     0.050        27.345    0.247        8.168
6 15-30           365.   5.840   4.050     87.     1.968       718.  11.498   171.     0.455       326.999    5.231       77.942
7 50-20          6666.   1.470   1.700     71.     1.505     10032.   2.212   106.     0.029       290.945    0.064        3.098
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------------- 1445.121   10.615      155.569
AVERAGE SUM OF CYCLES 6-7 -------------------------------------------------------------------- 1466.689   10.617      174.417

          HONDA CL350K3         RUN-1                               B - COLD CYCLE
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CYCLE        CONCENTRATION AS DETERMINED        WEIGHTING          W   E   I   G   H   T   E   D
NUMBER          HC          CO         NO(K)       FACTOR            HC           CO          NO(K)
------------------------------------------------------------------------------------------
   1         1004.349      8.145     204.155      0.0875          87.880      0.712        17.863
   2         1337.490      9.714     143.846      0.0875         117.030      0.850        12.586
   3         1406.054     10.705     147.862      0.0875         123.029      0.936        12.937
   4         1611.653     10.390     134.569      0.0875         141.019      0.909        11.774
   6         1488.256     10.620     193.264      0.3250         483.683      3.451        62.811
   7         1445.121     10.615     155.569      0.3250         469.664      3.449        50.560
SUM------------(TRIP COMPOSITE)--------------------------------- 1422.308     10.310       168.534
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DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
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PETRO CHEM COMPUTING, INC

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          HONDA CL350K3          RUN-2                              - COLD CYCLE              K = 1.0000    W =    505.
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                 CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D    WEIGHTING        W E I G H T E D
MODE              HC       CO    CO2    NO(K)    FACTOR      HC       CO   NO(K)   FACTOR         HC        CO        NO(K)
------------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE           307.   2.180   9.630    57.     1.312      402.   2.860    74.    0.042        16.917   0.120      3.141
2 0-25           522.   6.550   8.500   320.     1.175      613.   7.697   376.    0.244       149.677   1.878     91.756
3 30             384.   6.680   8.390   125.     1.193      458.   7.975   149.    0.118        54.099   0.941     17.610
4 30-15         3068.   4.030   5.130    65.     1.386     4253.   5.587    90.    0.062       263.723   0.346      5.587
5 15             509.   7.850   7.200    77.     1.241      632.   9.749    95.    0.050        31.608   0.487      4.781
6 15-30          541.   8.350   7.640   178.     1.169      632.   9.764   208.    0.455       287.859   4.442     94.711
7 50-20         4058.   3.610   4.800    78.     1.319     5355.   4.763   102.    0.029       155.300   0.138      2.985
SUM------------(CYCLE COMPOSITE)---------------------------------------------------------- 959.186   8.354    220.573
**CYCLE 2**
1 IDLE          1063.   4.120   8.180    57.     1.273     1353.   5.245    72.    0.042        56.846   0.220      3.048
2 0-25          1025.   8.690   6.940   118.     1.170     1199.  10.168   138.    0.244       292.644   2.481     33.689
3 30             560.   9.740   6.470    69.     1.213      679.  11.823    83.    0.118        80.215   1.395      9.883
4 30-15         2807.   4.770   4.360    55.     1.483     4163.   7.074    81.    0.062       258.116   0.438      5.057
5 15             410.   4.400   8.600   105.     1.289      528.   5.674   135.    0.050        26.439   0.283      6.771
6 15-30          810.   8.810   7.040   123.     1.176      953.  10.369   144.    0.455       433.771   4.717     65.868
7 50-20         3447.   2.970   5.300   101.     1.379     4756.   4.098   139.    0.029       137.942   0.118      4.041
SUM------------(CYCLE COMPOSITE)--------------------------------------------------------- 1285.975   9.655    128.361
**CYCLE 3**
1 IDLE          1021.   3.370   8.600    69.     1.273     1300.   4.291    87.    0.042        54.601   0.180      3.690
2 0-25           969.   8.240   7.140   144.     1.178     1141.   9.708   169.    0.244       278.577   2.368     41.398
3 30             827.  10.800   5.770    53.     1.202      994.  12.981    63.    0.118       117.299   1.531      7.517
4 30-15         2920.   5.130   4.430    49.     1.428     4172.   7.329    70.    0.062       258.664   0.454      4.340
5 15             404.   5.170   8.390   109.     1.270      513.   6.569   138.    0.050        25.667   0.328      6.925
6 15-30          535.   8.960   6.970   132.     1.205      644.  10.801   159.    0.455       293.458   4.914     72.404
7 50-20         2977.   2.530   5.660   149.     1.429     4256.   3.617   213.    0.029       123.452   0.104      6.178
SUM------------(CYCLE COMPOSITE)--------------------------------------------------------- 1151.721   9.883    142.455
**CYCLE 4**
1 IDLE           937.   3.430   8.600    77.     1.280     1199.   4.390    98.    0.042        50.378   0.184      4.139
2 0-25           796.   7.750   6.710   151.     1.266     1008.   9.818   191.    0.244       246.074   2.395     46.680
3 30            1035.  10.930   5.490    57.     1.201     1243.  13.127    68.    0.118       146.683   1.549      8.078
4 30-15         3692.   5.480   4.410    55.     1.301     4806.   7.134    71.    0.062       298.015   0.442      4.439
5 15             385.   4.930   8.470   105.     1.277      491.   6.297   134.    0.050        24.590   0.314      6.706
6 15-30          570.   8.770   7.050   151.     1.203      685.  10.552   181.    0.455       312.065   4.801     82.669
7 50-20         2916.   3.650   5.840   176.     1.340     3909.   4.893   235.    0.029       113.385   0.141      6.843
SUM------------(CYCLE COMPOSITE)--------------------------------------------------------- 1191.193   9.829    159.557
AVERAGE SUM OF CYCLES 1-4 --------------------------------------------------------------- 1147.019   9.430    162.736
```

```
          HONDA CL350K3          RUN-2                              - COLD CYCLE              K = 1.0000    W =    505.
------------------------------------------------------------------------------------------------------------------------
                 CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D    WEIGHTING        W E I G H T E D
MODE              HC       CO    CO2    NO(K)    FACTOR      HC       CO   NO(K)   FACTOR         HC        CO        NO(K)
------------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE           765.   3.280   8.820    46.     1.284      982.   4.213    59.    0.042        41.279   0.176      2.482
2 0-25           571.   8.050   7.400   196.     1.204      687.   9.693   236.    0.244       167.767   2.365     57.587
3 30             839.  11.350   5.310    46.     1.219     1023.  13.840    56.    0.118       120.722   1.633      6.618
4 30-15         2912.   4.550   4.630    46.     1.442     4201.   6.564    66.    0.062       260.487   0.407      4.114
5 15             316.   4.550   8.710   109.     1.280      404.   5.824   139.    0.050        20.227   0.291      6.977
6 15-30          768.   9.300   6.650   116.     1.195      918.  11.117   138.    0.455       417.734   5.058     63.095
7 50-20         2860.   2.360   5.790   328.     1.441     4122.   3.401   472.    0.029       119.559   0.098     13.711
SUM------------(CYCLE COMPOSITE)--------------------------------------------------------- 1147.777  10.030    154.587
**CYCLE 7**
1 IDLE           965.   3.310  11.540    69.     1.018      982.   3.371    70.    0.042        41.278   0.141      2.951
2 0-25           979.   7.470   7.270   133.     1.202     1176.   8.979   159.    0.244       287.150   2.191     39.010
3 30             979.  11.070   5.400    49.     1.209     1183.  13.384    59.    0.118       139.678   1.579      6.991
4 30-15         2816.   5.110   4.490    53.     1.437     4048.   7.346    76.    0.062       250.992   0.455      4.723
5 15             313.   4.140   8.820   105.     1.291      404.   5.346   135.    0.050        20.210   0.267      6.779
6 15-30          755.   8.750   6.840   130.     1.205      909.  10.546   156.    0.455       414.043   4.798     71.292
7 50-20         2996.   2.870   5.640   146.     1.406     4213.   4.036   205.    0.029       122.185   0.117      5.954
SUM------------(CYCLE COMPOSITE)--------------------------------------------------------- 1275.540   9.550    137.703
AVERAGE SUM OF CYCLES 6-7 --------------------------------------------------------------- 1211.658   9.790    146.145
```

```
          HONDA CL350K3          RUN-2                              - COLD CYCLE
----------------------------------------------------------------------------------------
CYCLE         CONCENTRATION AS DETERMINED         WEIGHTING          W  E  I  G  H  T  E  D
NUMBER           HC          CO        NO(K)       FACTOR            HC          CO         NO(K)
----------------------------------------------------------------------------------------
  1           959.186      8.354     220.573      0.0875           83.928      0.731       19.300
  2          1285.975      9.655     128.361      0.0875          112.522      0.844       11.231
  3          1151.721      9.883     142.455      0.0875          100.775      0.864       12.464
  4          1191.193      9.829     159.557      0.0875          104.229      0.860       13.961
  6          1147.777     10.030     154.587      0.3250          373.027      3.259       50.240
  7          1275.540      9.550     137.703      0.3250          414.550      3.103       44.753
SUM-----------(TRIP COMPOSITE)-------------------------------    1189.035      9.664      151.952
```

```
DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
```

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```
HONDA  CL350K3      RUN-3                                                  B - COLD CYCLE           K = 1.0000    W =   505.
---------------------------------------------------------------------------------------------------------------------------
                 CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D   WEIGHTING        W E I G H T E D
MODE               HC      CO     CO2    NO(K)    FACTOR      HC       CO   NO(K)   FACTOR          HC       CO       NO(K)
---------------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE           3940.  1.610   9.590     46.     0.989     3899.  1.593     45.    0.042       163.783   0.066      1.912
2 0-25           2507.  6.670   8.570    113.     0.992     2487.  6.618    112.    0.244       606.996   1.614     27.359
3 30             1007.  7.480   8.390    141.     1.097     1104.  8.205    154.    0.118       130.355   0.968     18.292
4 30-15           929.  3.920   5.840     79.     1.667     1530.  6.456    130.    0.062        94.870   0.400      8.067
5 15              332.  6.960   8.020     93.     1.222      405.  8.510    113.    0.050        20.297   0.425      5.685
6 15-30          1165.  8.010   8.150    129.     1.081     1259.  8.659    139.    0.455       573.024   3.939     63.450
7 50-20          2876.  3.270   5.340    133.     1.438     4136.  4.703    191.    0.029       119.963   0.136      5.547
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------------- 1709.289   7.552    130.275
**CYCLE 2**
1 IDLE           1245.  2.750   8.080     69.     1.342     1671.  3.692     92.    0.042        70.206   0.155      3.890
2 0-25           7349.  6.970   7.530    137.     0.765     5622.  5.332    104.    0.244      1371.932   1.301     25.375
3 30             2663. 10.270   6.710     69.     0.984     2623. 10.115     67.    0.118       309.515   1.193      8.019
4 30-15          2168.  4.500   5.050     70.     1.503     3260.  6.767    105.    0.062       202.151   0.419      6.527
5 15             2066.  5.080   8.460     97.     1.095     2264.  5.567    106.    0.050       113.205   0.278      5.315
6 15-30          1988.  9.070   8.100    167.     0.980     1950.  8.896    163.    0.455       887.281   4.048     74.535
7 50-20          3766.  2.860   5.680    172.     1.297     4885.  3.710    223.    0.029       141.680   0.107      6.470
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------------- 3095.974   7.503    130.334
**CYCLE 3**
1 IDLE           1461.  2.810   7.850     69.     1.338     1955.  3.761     92.    0.042        82.134   0.157      3.879
2 0-25           7289.  8.300   7.410    169.     0.746     5438.  6.193    126.    0.244      1327.105   1.511     30.769
3 30             2632. 10.890   6.159     69.     1.004     2643. 10.937     69.    0.118       311.919   1.290      8.177
4 30-15          2136.  4.090   4.960     70.     1.557     3326.  6.368    109.    0.062       206.216   0.394      6.758
5 15             1920.  4.560   9.000    121.     1.085     2084.  4.951    131.    0.050       104.241   0.247      6.569
6 15-30          1813.  8.450   7.440    177.     1.064     1929.  8.993    188.    0.455       878.017   4.092     85.719
7 50-20          3756.  2.800   5.710    146.     1.298     4877.  3.635    189.    0.029       141.440   0.105      5.497
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------------- 3051.075   7.799    147.370
**CYCLE 4**
1 IDLE           1431.  2.950   8.040     69.     1.310     1876.  3.867     90.    0.042        78.792   0.162      3.799
2 0-25           6818.  7.890   6.850    234.     0.798     5444.  6.300    186.    0.244      1328.422   1.537     45.592
3 30             2843. 11.350   5.770     69.     0.998     2839. 11.337     68.    0.118       335.117   1.337      8.123
4 30-15          2236.  4.930   4.220     70.     1.593     3562.  7.855    111.    0.062       220.900   0.487      6.915
5 15             1587.  3.680   9.620    121.     1.100     1746.  4.050    133.    0.050        87.337   0.202      6.658
6 15-30          1693.  8.750   6.590    146.     1.133     1918.  9.917    165.    0.455       873.069   4.512     75.291
7 50-20          3794.  2.690   5.910    168.     1.277     4845.  3.435    214.    0.029       140.530   0.099      6.222
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------------- 3064.169   8.339    152.613
AVERAGE SUM OF CYCLES 1-4 ------------------------------------------------------------------ 2790.127   7.798    140.148
```

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```
HONDA  CL350K3      RUN-3                                                  B - COLD CYCLE           K = 1.0000    W =   505.
---------------------------------------------------------------------------------------------------------------------------
                 CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D   WEIGHTING        W E I G H T E D
MODE               HC      CO     CO2    NO(K)    FACTOR      HC       CO   NO(K)   FACTOR          HC       CO       NO(K)
---------------------------------------------------------------------------------------------------------------------------
**CYCLE 5**
1 IDLE           1189.  2.980   7.680     81.     1.387     1649.  4.133    112.    0.042        69.264   0.173      4.718
2 0-25           1345.  8.470   7.240    212.     1.121     1508.  9.500    237.    0.244       368.096   2.318     58.019
3 30             1659. 10.370   5.600     93.     1.152     1912. 11.955    107.    0.118       225.698   1.410     12.652
4 30-15          5390.  4.800   5.000    345.     1.096     5911.  5.264    378.    0.062       366.503   0.326     23.458
5 15             1458.  4.390   9.040    153.     1.131     1650.  4.969    173.    0.050        82.519   0.248      8.659
6 15-30          1408.  8.570   7.290    196.     1.107     1558.  9.489    217.    0.455       709.341   4.317     98.743
7 50-20          4618.  2.990   6.470    207.     1.119     5169.  3.347    231.    0.029       149.923   0.097      6.720
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------------- 1971.347   8.891    212.972
**CYCLE 7**
1 IDLE           1789.  3.150   8.080    105.     1.251     2238.  3.941    131.    0.042        94.026   0.165      5.518
2 0-25           1566.  7.280   7.570    175.     1.123     1760.  8.182    196.    0.244       429.454   1.996     47.991
3 30             1775. 11.640   5.580    105.     1.088     1932. 12.674    114.    0.118       228.056   1.495     13.490
4 30-15          5018.  5.430   4.940    105.     1.109     5565.  6.022    116.    0.062       345.038   0.373      7.219
5 15             1487.  3.170   9.920    177.     1.105     1644.  3.505    195.    0.050        82.227   0.175      9.787
6 15-30          1394.  8.250   7.440    309.     1.109     1546.  9.152    342.    0.455       703.638   4.164    155.971
7 50-20          4925.  3.210   6.330    192.     1.094     5387.  3.511    210.    0.029       156.251   0.101      6.091
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------------- 2038.692   8.472    246.070
AVERAGE SUM OF CYCLES 6-7 ------------------------------------------------------------------ 2005.020   8.682    229.521

HONDA  CL350K3      RUN-3                                                  B - COLD CYCLE
---------------------------------------------------------------------------------------------
CYCLE        CONCENTRATION AS DETERMINED        WEIGHTING           W   E   I   G   H   T   E   D
NUMBER          HC          CO         NO(K)       FACTOR              HC          CO          NO(K)
---------------------------------------------------------------------------------------------
   1         1709.289      7.552     130.275      0.0875           149.562      0.660      11.399
   2         3095.974      7.503     130.334      0.0875           270.897      0.656      11.404
   3         3051.075      7.799     147.370      0.0875           266.969      0.682      12.894
   4         3064.169      8.339     152.613      0.0875           268.114      0.729      13.353
   6         1971.347      8.891     212.972      0.3250           640.687      2.889      69.216
   7         2038.692      8.472     246.070      0.3250           662.575      2.753      79.973
SUM-----------(TRIP COMPOSITE)------------------------------------ 2258.807      8.372     198.241
```

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)

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HONDA  CL350K3      RUN-4                                          B - COLD CYCLE             K = 1.0000   W =    505.
------------------------------------------------------------------------------------------------------------------------
              CONCENTRATION  AS  MEASURED  DILUTION       A D J U S T E D   WEIGHTING        W E I G H T E D
MODE            HC       CO     CO2    NO(K)    FACTOR        HC      CO   NO(K)   FACTOR         HC       CO       NO(K)
------------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE         483.   1.890   8.780     50.     1.415       683.   2.674    70.    0.042        28.706   0.112      2.971
2 0-25         651.   6.270   8.400    125.     1.184       771.   7.428   148.    0.244       188.202   1.812     36.137
3 30           378.   8.310   7.840     93.     1.169       441.   9.714   108.    0.118        52.144   1.146     12.829
4 30-15       3097.   4.610   5.170     62.     1.340      4150.   6.178    83.    0.062       257.325   0.363      5.151
5 15           827.   5.890   8.600     93.     1.165       964.   6.866   108.    0.050        48.204   0.343      5.420
6 15-30        819.   8.150   7.090    172.     1.203       985.   9.807   206.    0.455       448.428   4.462     94.175
7 50-20       3799.   2.520   5.560     96.     1.327      5043.   3.345   127.    0.029       146.250   0.097      3.695
SUM-------------(CYCLE COMPOSITE)-------------------------------------------------------- 1169.262   8.357    160.381
**CYCLE 2**
1 IDLE        1231.   2.610   7.710     46.     1.401      1725.   3.658    64.    0.042        72.471   0.153      2.708
2 0-25        1150.   8.560   7.090     95.     1.149      1322.   9.841   109.    0.244       322.605   2.401     26.650
3 30           868.   8.410   6.350     57.     1.261      1095.  10.610    71.    0.118       129.228   1.252      8.486
4 30-15       2969.   3.710   4.710     49.     1.483      4405.   5.505    72.    0.062       273.154   0.341      4.508
5 15           114.   7.420   7.680     97.     1.259       143.   9.344   122.    0.050         7.178   0.467      6.108
6 15-30        809.   8.640   7.300    119.     1.160       938.  10.027   138.    0.455       427.204   4.562     62.839
7 50-20       3551.   2.890   5.380    119.     1.360      4830.   3.931   161.    0.029       140.073   0.113      4.694
SUM-------------(CYCLE COMPOSITE)-------------------------------------------------------- 1371.916   9.292    115.994
**CYCLE 3**
1 IDLE         979.   2.690   8.080     69.     1.383      1354.   3.721    95.    0.042        56.877   0.156      4.008
2 0-25        1007.   8.150   7.250    158.     1.165      1173.   9.497   184.    0.244       286.337   2.317     44.926
3 30           895.  11.260   6.030     57.     1.148      1027.  12.930    65.    0.118       121.279   1.525      7.723
4 30-15       2868.   5.090   4.550     47.     1.422      4080.   7.241    66.    0.062       252.965   0.448      4.145
5 15           840.   3.160   9.460    112.     1.193      1002.   3.772   133.    0.050        50.135   0.188      6.684
6 15-30        822.   8.670   7.310    134.     1.156       951.  10.030   155.    0.455       432.717   4.564     70.540
7 50-20       3332.   2.790   5.810     74.     1.342      4472.   3.744    99.    0.029       129.689   0.108      2.880
SUM-------------(CYCLE COMPOSITE)-------------------------------------------------------- 1330.001   9.309    140.910
**CYCLE 4**
1 IDLE        1007.   2.950   7.880     54.     1.388      1398.   4.096    74.    0.042        58.727   0.172      3.149
2 0-25         982.   8.100   7.130    413.     1.184      1163.   9.595   489.    0.244       283.836   2.341    119.373
3 30          1021.   1.490   5.770     57.     1.903      1943.   2.836   108.    0.118       229.325   0.334     12.802
4 30-15       2805.   4.920   4.730     57.     1.418      3979.   6.980    80.    0.062       246.755   0.432      5.014
5 15           812.   4.010   9.110    117.     1.209       981.   4.848   141.    0.050        49.091   0.242      7.073
6 15-30        716.   9.110   7.010    925.     1.175       841.  10.706  1087.    0.455       382.858   4.871    494.614
7 50-20       3132.   2.520   5.880     86.     1.377      4315.   3.472   118.    0.029       125.160   0.100      3.436
SUM-------------(CYCLE COMPOSITE)-------------------------------------------------------- 1375.754   8.495    645.463
AVERAGE SUM OF CYCLES 1-4 --------------------------------------------------------------- 1311.733   8.863    265.687
```

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HONDA  CL350K3      RUN-4                                          B - COLD CYCLE             K = 1.0000   W =    505.
------------------------------------------------------------------------------------------------------------------------
              CONCENTRATION  AS  MEASURED  DILUTION       A D J U S T E D   WEIGHTING        W E I G H T E D
MODE            HC       CO     CO2    NO(K)    FACTOR        HC      CO   NO(K)   FACTOR         HC       CO       NO(K)
------------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE         703.   3.020   8.040     46.     1.406       988.   4.247    64.    0.042        41.528   0.178      2.717
2 0-25         785.   8.760   7.190     91.     1.167       916.  10.228   106.    0.244       223.657   2.495     25.927
3 30           895.  10.530   5.800     46.     1.205      1078.  12.690    55.    0.118       127.276   1.497      6.541
4 30-15       2614.   6.570   5.200     46.     1.282      3351.   8.424    58.    0.062       207.814   0.522      3.657
5 15           513.   2.360  10.370    129.     1.197       614.   2.827   154.    0.050        30.727   0.141      7.726
6 15-30        819.   9.170   6.920    111.     1.170       958.  10.732   129.    0.455       436.122   4.883     59.108
7 50-20       3019.   2.970   5.780    139.     1.377      4158.   4.091   191.    0.029       120.610   0.118      5.553
SUM-------------(CYCLE COMPOSITE)-------------------------------------------------------- 1187.737   9.837    111.231
**CYCLE 7**
1 IDLE         937.   3.140   8.080     57.     1.359      1274.   4.270    77.    0.042        53.520   0.179      3.255
2 0-25         990.   8.520   7.130    141.     1.163      1152.   9.915   164.    0.244       281.127   2.419     40.039
3 30          1396.  11.440   5.770     57.     1.115      1557.  12.762    63.    0.118       183.767   1.505      7.503
4 30-15       3996.   3.020   4.800     51.     1.364      5453.   4.121    69.    0.062       338.086   0.255      4.314
5 15           403.   2.560  10.260    117.     1.216       487.   [illegible]   141.    0.050        24.398   0.154      7.083
6 15-30        941.  14.000   6.880    106.     0.973       915.  13.627   103.    0.455       416.764   6.200     46.946
7 50-20       3945.   2.700   6.170    144.     1.230      4855.   3.323   177.    0.029       140.813   0.096      5.139
SUM-------------(CYCLE COMPOSITE)-------------------------------------------------------- 1438.479  10.812    114.283
AVERAGE SUM OF CYCLES 6-7 --------------------------------------------------------------- 1313.108  10.326    112.757
```

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HONDA  CL350K3      RUN-4                                          B - COLD CYCLE
----------------------------------------------------------------------------------------------
CYCLE        CONCENTRATION AS DETERMINED         WEIGHTING          W   E   I   G   H   T   E   D
NUMBER         HC            CO          NO(K)      FACTOR               HC           CO          NO(K)
----------------------------------------------------------------------------------------------
  1          1169.262      8.357      160.381      0.0875           102.310      0.731       14.033
  2          1371.916      9.292      115.994      0.0875           120.042      0.813       10.149
  3          1330.001      9.309      140.910      0.0875           116.375      0.814       12.329
  4          1375.754      8.495      645.463      0.0875           120.378      0.743       56.478
  6          1187.737      9.837      111.231      0.3250           386.014      3.197       36.150
  7          1438.479     10.812      114.283      0.3250           467.505      3.513       37.142
SUM-------------(TRIP COMPOSITE)------------------------------- 1312.627      9.813      166.282
```

```
DILUTION FACTOR = 13.5/(CO2+0.5*CO+10.8*HC)
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HONDA CL350K3 RUN 5 S - COLD CYCLE K = 1.0000 W = 505.

MODE	CONCENTRATION AS MEASURED				DILUTION	A D J U S T E D			WEIGHTING	W E I G H T E D		
	HC	CO	CO2	NO(K)	FACTOR	HC	CO	NO(K)	FACTOR	HC	CO	NO(K)
CYCLE 1												
1 IDLE	428.	4.930	7.750	64.	1.358	581.	6.695	86.	0.042	24.411	0.281	3.650
2 0-25	482.	7.040	7.910	138.	1.213	584.	8.541	167.	0.244	142.697	2.084	40.855
3 30	509.	6.640	8.730	170.	1.150	585.	7.641	195.	0.118	69.120	0.901	23.085
4 30-15	1534.	4.930	6.020	108.	1.429	2193.	7.048	154.	0.062	135.979	0.437	9.573
5 15	814.	8.390	7.720	104.	1.133	922.	9.508	117.	0.050	46.126	0.475	5.893
6 15-30	763.	9.380	7.410	148.	1.121	856.	10.523	166.	0.455	389.498	4.788	75.551
7 5C-20	3769.	3.840	5.010	128.	1.318	4967.	5.061	168.	0.029	144.071	0.146	4.892
SUM------------(CYCLE COMPOSITE)										951.906	9.114	163.502
CYCLE 2												
1 IDLE	889.	4.850	7.680	77.	1.310	1164.	6.355	100.	0.042	48.928	0.266	4.237
2 0-25	861.	8.480	7.150	109.	1.176	1013.	9.980	128.	0.244	247.260	2.435	31.302
3 30	814.	9.490	7.430	117.	1.110	904.	10.541	129.	0.118	106.690	1.243	15.335
4 30-15	1761.	6.000	5.360	90.	1.412	2488.	8.477	127.	0.062	154.273	0.525	7.884
5 15	874.	7.320	8.270	117.	1.126	984.	8.244	131.	0.050	49.219	0.412	6.588
6 15-30	779.	9.190/	7.570	168.	1.114	868.	10.245	187.	0.455	395.150	4.661	85.218
7 50-20	3402.	4.050	5.420	161.	1.304	4436.	5.281	209.	0.029	128.655	0.153	6.088
SUM------------(CYCLE COMPOSITE)										1130.179	9.698	156.656
CYCLE 3												
1 IDLE	1617.	4.740	7.400	90.	1.259	2035.	5.968	113.	0.042	85.509	0.250	4.759
2 0-25	1435.	8.140	7.120	124.	1.138	1633.	9.264	141.	0.244	398.517	2.260	34.436
3 30	728.	9.950	7.400	117.	1.101	802.	10.962	128.	0.118	94.642	1.293	15.210
4 30-15	1560.	6.820	5.210	90.	1.407	2195.	9.596	126.	0.062	136.095	0.594	7.851
5 15	979.	6.070	8.600	130.	1.142	1118.	6.934	148.	0.050	55.921	0.346	7.[illegible]
6 15-30	754.	8.590	7.530	154.	1.147	864.	9.854	176.	0.455	393.574	4.483	80.385
7 50-20	3410.	4.330	5.380	136.	1.291	4403.	5.591	175.	0.029	127.710	0.162	5.093
SUM------------(CYCLE COMPOSITE)										1291.970	9.392	155.162
CYCLE 4												
1 IDLE	1176.	4.670	7.370	90.	1.321	1553.	6.169	118.	0.042	65.255	0.259	4.994
2 0-25	1173.	7.980	7.230	147.	1.161	1362.	9.266	170.	0.244	332.355	2.261	41.650
3 30	837.	7.520	7.370	117.	1.204	1008.	9.061	140.	0.118	119.005	1.069	16.635
4 3C-15	1543.	7.150	5.400	88.	1.362	2102.	9.742	119.	0.062	130.354	0.604	7.434
5 15	872.	4.960	9.140	143.	1.154	1006.	5.725	165.	0.050	50.327	0.286	8.253
6 15-30	711.	9.110	7.650	178.	1.117	794.	10.132	198.	0.455	361.586	4.632	90.523
7 50-20	3321.	4.190	5.470	163.	1.300	4318.	5.448	211.	0.029	125.226	0.157	6.146
SUM------------(CYCLE COMPOSITE)										1184.111	9.270	175.637
AVERAGE SUM OF CYCLES 1-4										1139.541	9.369	162.739

PETRO-CHEM COMPUTING, INC.

HONDA CL350K3 RUN 5 S - COLD CYCLE K = 1.0000 W = 505.

MODE	CONCENTRATION AS MEASURED				DILUTION	A D J U S T E D			WEIGHTING	W E I G H T E D		
	HC	CO	CO2	NO(K)	FACTOR	HC	CO	NO(K)	FACTOR	HC	CO	NO(K)
CYCLE 6												
1 IDLE	846.	4.590	11.720	103.	0.971	821.	4.458	100.	0.042	34.511	0.187	4.201
2 0-25	713.	9.330	11.080	149.	0.877	626.	8.191	130.	0.244	152.745	1.998	31.920
3 30	839.	10.400	9.640	117.	0.920	772.	9.576	107.	0.118	91.167	1.130	12.713
4 30-15	2195.	6.710	7.330	99.	1.110	2437.	7.452	109.	0.062	151.146	0.462	6.817
5 15	609.	4.330	15.090	157.	0.809	492.	3.505	127.	0.050	24.648	0.175	6.354
6 15-30	584.	8.550	12.400	171.	0.837	489.	7.163	143.	0.455	222.639	3.259	65.190
7 50-20	3040.	3.900	8.950	218.	1.022	3107.	3.987	222.	0.029	90.129	0.115	6.463
SUM------------(CYCLE COMPOSITE)										766.987	7.328	133.660
CYCLF 7												
1 IDLE	566.	4.260	12.910	103.	0.926	524.	3.946	95.	0.042	22.023	0.165	4.007
2 0-25	632.	8.320	10.890	141.	0.921	582.	7.668	129.	0.244	142.126	1.871	31.708
3 30	993.	10.300	10.830	117.	0.850	844.	8.758	99.	0.118	99.635	1.033	11.739
4 30-15	1987.	6.970	7.630	97.	1.093	2172.	7.621	106.	0.062	134.704	0.472	6.575
5 15	784.	8.270	11.120	153.	0.900	706.	7.447	137.	0.050	35.300	0.372	6.889
6 15-30	636.	8.110	12.550	184.	0.838	533.	6.800	154.	0.455	242.657	3.094	70.202
7 50-20	3045.	4.090	9.200	277.	0.997	3037.	4.080	276.	0.029	88.100	0.118	8.014
SUM------------(CYCLE COMPOSITE)										764.549	7.127	139.138
AVERAGE SUM OF CYCLES 6-7										765.768	7.228	136.399

HONDA CL350K3 RUN 5 S - COLD CYCLE

CYCLE	CONCENTRATION AS DETERMINED			WEIGHTING	W E I G H T E D		
NUMBER	HC	CO	NO(K)	FACTOR	HC	CO	NO(K)
1	951.906	9.114	163.502	0.0875	83.291	0.797	14.306
2	1130.179	9.698	156.656	0.0875	98.890	0.848	13.707
3	1291.970	9.392	155.162	0.0875	113.047	0.821	13.576
4	1184.111	9.270	175.637	0.0875	103.609	0.811	15.368
6	766.987	7.328	133.660	0.3250	249.271	2.381	43.439
7	764.949	7.127	139.138	0.3250	248.478	2.316	45.219
SUM------------(TRIP COMPOSITE)					896.589	7.977	145.618

PETRO-CHEM COMPUTING, INC.

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)

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HONDA CL350K3        RUN    6                                          S - COLD CYCLE            K = 1.0000    W =    505.
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            CONCENTRATION  AS  MEASURED  DILUTION       A D J U S T E D   WEIGHTING        W E I G H T E D
MODE           HC      CO     CO2    NO(K)    FACTOR      HC      CO   NO(K)   FACTOR          HC        CO        NO(K)
-------------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 ICLF        524.   3.630   9.030    77.     1.270      665.   4.612    97.    0.042         27.965    0.193      4.109
2 0-25        497.   6.270   8.610   176.     1.180      586.   7.402   207.    0.244        143.170    1.806     50.700
3 30          435.   5.860   9.330   197.     1.139      495.   6.674   224.    0.118         58.467    0.787     26.478
4 30-15      1182.   4.750   6.120    88.     1.483     1753.   7.048   130.    0.062        108.745    0.437      8.096
5 15          479.   7.780   8.140    90.     1.155      553.   8.990   104.    0.050         27.677    0.449      5.200
6 15-30       585.   8.790   7.880   163.     1.123      657.   9.875   183.    0.455        299.031    4.493     83.319
7 50-20      3085.   3.780   5.230   133.     1.387     4279.   5.244   184.    0.029        124.116    0.152      5.350
SUM-----------(CYCLE COMPOSITE)----------------------------------------------------------    789.175    8.319    183.255
**CYCLE 2**
1 IDLE        671.   3.750   8.370    51.     1.321      886.   4.956    67.    0.042         37.251    0.208      2.831
2 0-25        663.   7.140   7.940   137.     1.185      786.   8.467   162.    0.244        191.860    2.066     39.645
3 30          527.   9.060   7.940   103.     1.112      586.  10.075   114.    0.118         69.152    1.188     13.515
4 30-15      1381.   5.940   5.430    64.     1.465     2024.   8.707    93.    0.062        125.513    0.539      5.816
5 15          354.   6.320   8.790   103.     1.175      416.   7.430   121.    0.050         20.811    0.371      6.055
6 15-30       510.   8.700   7.230   152.     1.195      609.  10.399   181.    0.455        277.370    4.731     82.067
7 50-20      2840.   3.870   5.430   120.     1.389     3947.   5.379   166.    0.029        114.474    0.155      4.836
SUM-----------(CYCLE COMPOSITE)------------------------------------------------- ------    836.435    9.262    155.368
**CYCLE 3**
1 IDLF       1791.   3.820   7.180    64.     1.315     2355.   5.024    84.    0.042         98.937    0.211      3.535
2 0-25        406.   6.170   7.430   113.     1.323      537.   8.167   149.    0.244        131.138    1.992     36.499
3 30          694.   9.690   7.530    90.     1.104      766.  10.705    99.    0.118         90.474    1.263     11.733
4 30-15      1585.   6.430   5.370    65.     1.408     2232.   9.054    91.    0.062        138.384    0.561      5.675
5 15          247.   5.940   8.910   103.     1.193      294.   7.090   122.    0.050         14.742    0.354      6.147
6 15-30       461.   8.370   8.050   130.     1.138      524.   9.531   148.    0.455        233.865    4.336     67.359
7 50-20       266.   3.680   5.840   172.     1.819      484.   6.697   313.    0.029         14.039    0.194      9.077
SUM-----------(CYCLE COMPOSITE)----------------------------------------------------------    726.582    8.914    140.027
**CYCLF 4**
1 IDLF       1834.   4.920   7.650    64.     1.199     2199.   5.900    76.    0.042         92.377    0.247      3.223
2 0-25        221.   7.190   7.790   128.     1.247      275.   8.969   159.    0.244         67.267    2.188     38.960
3 30          846.   9.910   7.270    90.     1.103      933.  10.936    99.    0.118        110.171    1.290     11.720
4 30-15      1752.   5.910   5.120    63.     1.454     2548.   8.597    91.    0.062        158.023    0.533      5.682
5 15          253.   5.860   8.730   103.     1.215      307.   7.120   125.    0.050         15.370    0.356      6.257
6 15-30       409.   8.580   7.890   122.     1.148      469.   9.856   140.    0.455        213.788    4.484     63.770
7 50-20      2518.   4.180   6.010   188.     1.340     3374.   5.601   251.    0.029         97.862    0.162      7.306
SUM-----------(CYCLE COMPOSITE)----------------------------------------------------------    754.861    9.263    136.921
AVERAGE SUM OF CYCLES 1-4 ---------------------------------------------------------------    776.763    8.939    153.893
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HONDA CL350K3        RUN    6                                          S - COLD CYCLE            K = 1.0000    W =    505.
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            CONCENTRATION  AS  MEASURED  DILUTION       A D J U S T E D   WEIGHTING        W E I G H T E D
MODE           HC      CO     CO2    NO(K)    FACTOR      HC      CO   NO(K)   FACTOR          HC        CO        NO(K)
-------------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE        190.   4.500   7.460    64.     1.462      277.   6.580    93.    0.042         11.669    0.276      3.930
2 0-25        721.   7.610   7.410   161.     1.208      871.   9.200   194.    0.244        212.686    2.244     47.493
3 30         1133.  10.320   6.610    77.     1.115     1264.  11.516    85.    0.118        149.193    1.358     10.139
4 30-15      1798.   6.660   4.990    57.     1.413     2540.   9.410    80.    0.062        157.515    0.583      4.993
5 15         1402.   5.120   8.970   103.     1.111     1558.   5.691   114.    0.050         77.923    0.284      5.724
6 15-30       931.   8.770   7.830   162.     1.096     1021.   9.618   177.    0.455        464.602    4.376     80.843
7 50-20      2722.   4.360   5.480    86.     1.367     3723.   5.964   117.    0.029        107.983    0.172      3.411
SUM-----------(CYCLE COMPOSITE)----------------------------------------------------------   1181.576    9.297    156.537
**CYCLE 7**
1 IDLE       1317.   4.450   7.650    64.     1.283     1690.   5.711    82.    0.042         70.994    0.239      3.450
2 0-25        293.   7.510   7.480   125.     1.255      367.   9.426   156.    0.244         89.740    2.300     38.285
3 30          880.  10.400   6.640    77.     1.133      997.  11.790    87.    0.118        117.719    1.391     10.300
4 30-15      1897.   6.280   4.590    59.     1.482     2812.   9.312    87.    0.062        174.398    0.577      5.424
5 15         1531.   5.190   9.140   103.     1.083     1658.   5.620   111.    0.050         82.905    0.261      5.577
6 15-30       251.   7.590   8.410   154.     1.162      291.   8.821   178.    0.455        132.731    4.013     81.437
7 50-20      2538.   4.010   8.750   131.     1.074     2726.   4.308   140.    0.029         79.077    0.124      4.081
SUM-----------(CYCLE COMPOSITE)----------------------------------------------------------    747.567    8.928    148.556
AVERAGE SUM OF CYCLES 6-7 ---------------------------------------------------------------    964.571    9.113    152.546

HONDA CL350K3        RUN    6                                          S - COLD CYCLE
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CYCLE       CONCENTRATION AS DETERMINED      WEIGHTING          W   E   I   G   H   T   E   D
NUMRER        HC          CO         NO(K)       FACTOR            HC          CO          NO(K)
-----------------------------------------------------------------------------------------
  1         789.175     8.319     183.255      0.0875           69.052      0.727       16.034
  2         836.435     9.262     155.368      0.0875           73.188      0.810       13.594
  3         726.582     8.914     140.027      0.0875           63.576      0.779       12.252
  4         754.861     9.263     136.921      0.0875           66.050      0.810       11.980
  6        1181.576     9.297     156.537      0.3250          384.012      3.021       50.874
  7         747.567     8.928     148.556      0.3250          242.959      2.901       48.280
SUM-----------(TRIP COMPOSITE)---------------------------------  898.839      9.052      153.018
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DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)

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HONDA SL-100        RUN 2       8-23-72                      B - COLD CYCLE          K = 1.0000   W =      0.
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              CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D   WEIGHTING         W E I G H T E D
MODE              HC     CO    CO2     NO(K)    FACTOR       HC      CO   NO(K)    FACTOR          HC       CO       NO(K)
-------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE          812.  6.870 10.040      70.     1.010       820.  6.940     70.    0.042       34.455   0.291      2.970
2 0-25          709.  3.790 11.690     909.     1.010       716.  3.829    918.    0.244      174.795   0.934    224.103
3 30           2007.  2.160 13.040     832.     0.890      1786.  1.922    740.    0.118      210.834   0.226     87.401
4 30-15         971.  5.990  8.300     239.     1.174      1140.  7.036    280.    0.062       70.718   0.436     17.406
5 15            606.  7.850  9.370     153.     1.039       629.  8.159    159.    0.050       31.495   0.407      7.951
6 15-30         740.  3.360 12.500    1168.     0.968       716.  3.252   1130.    0.455      325.928   1.479    514.438
7 50-20        3679.  7.330  7.400     141.     0.964      3547.  7.067    135.    0.029      102.871   0.204      3.942
SUM-------------(CYCLE COMPOSITE)----------------------------------------------------------  951.100   3.981    858.214
**CYCLE 2**
1 IDLE          854.  8.240  9.040      70.     1.029       879.  8.484     72.    0.042       36.931   0.356      3.027
2 0-25          735.  4.890 10.990     640.     1.019       749.  4.983    652.    0.244      182.758   1.215    159.136
3 30           3389.  2.780 12.530     698.     0.824      2795.  2.292    575.    0.118      329.837   0.270     67.933
4 30-15        1476.  5.250  6.200     190.     1.391      2054.  7.306    264.    0.062      127.355   0.452     16.393
5 15            771.  8.650  8.930     117.     1.029       793.  8.903    120.    0.050       39.678   0.445      6.021
6 15-30         755.  3.550 11.870     972.     1.002       757.  3.559    974.    0.455      344.465   1.619    443.471
7 50-20        5613.  4.770  4.140     202.     1.151      6466.  5.494    232.    0.029      187.515   0.159      6.748
SUM-------------(CYCLE COMPOSITE)---------------------------------------------------------- 1248.542   4.519    702.731
**CYCLE 3**
1 IDLE         1105.  7.950  9.260      81.     1.004      1110.  7.989     81.    0.042       46.640   0.335      3.418
2 0-25         1052.  6.930  9.330     473.     1.040      1094.  7.212    492.    0.244      267.169   1.759    120.124
3 30           3938.  4.380 11.450     460.     0.810      3191.  3.549    372.    0.118      376.566   0.418     43.986
4 30-15        2245.  5.950  6.230     129.     1.246      2799.  7.418    160.    0.062      173.544   0.459      9.972
5 15            895.  8.980  8.920     141.     1.015       909.  9.120    143.    0.050       45.450   0.456      7.160
6 15-30         896.  4.510 11.700     909.     0.971       870.  4.382    883.    0.455      396.132   1.993    401.880
7 50-20        6552.  4.730  3.900     214.     1.086      7121.  5.140    232.    0.029      206.512   0.149      6.745
SUM-------------(CYCLE COMPOSITE)---------------------------------------------------------- 1512.015   5.573    593.287
**CYCLE 4**
1 IDLE         1105.  8.050  9.150      93.     1.009      1115.  8.123     93.    0.042       46.835   0.341      3.941
2 0-25         1063.  4.940 10.980     626.     0.993      1055.  4.906    621.    0.244      257.630   1.197    151.718
3 30           3182.  4.920 11.000     393.     0.858      2730.  4.222    337.    0.118      322.219   0.498     39.796
4 30-15        2128.  5.560  5.750     141.     1.339      2849.  7.445    188.    0.062      176.674   0.461     11.706
5 15           1021.  9.090  8.710     141.     1.009      1031.  9.180    142.    0.050       51.556   0.459      7.119
6 15-30         925.  3.880 11.050     893.     1.036       958.  4.021    925.    0.455      436.249   1.829    421.157
7 50-20        4398.  4.850  4.490     178.     1.243      5466.  6.028    221.    0.029      158.541   0.174      6.416
SUM-------------(CYCLE COMPOSITE)---------------------------------------------------------- 1449.705   4.962    641.856
AVERAGE SUM OF CYCLES 1-4 ----------------------------------------------------------------- 1290.341   4.759    699.022
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HONDA SL-100        RUN 2       8-23-72                      B - COLD CYCLE          K = 1.0000   W =      0.
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              CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D   WEIGHTING         W E I G H T E D
MODE              HC     CO    CO2     NO(K)    FACTOR       HC      CO   NO(K)    FACTOR          HC       CO       NO(K)
-------------------------------------------------------------------------------------------------------------------
-**CYCLE 6**
1 IDLE          979.  8.340  8.930      70.     1.024      1002.  8.541     71.    0.042       42.113   0.358      3.011
2 0-25          933.  6.500 10.260     598.     0.998       931.  6.492    597.    0.244      227.375   1.584    145.734
3 30           3369.  5.370 10.890     315.     0.842      2837.  4.523    265.    0.118      334.873   0.533     31.310
4 30-15        2225.  4.830  5.910     153.     1.351      3007.  6.528    206.    0.062      186.453   0.404     12.821
5 15           1070.  9.310  8.390     117.     1.021      1092.  9.506    119.    0.050       54.627   0.475      5.973
6 15-30         950.  4.770 11.440     924.     0.976       927.  4.657    902.    0.455      422.033   2.119    410.483
7 50-20        6037.  4.440  9.270     227.     0.805      4860.  3.574    182.    0.029      140.953   0.103      5.300
SUM-------------(CYCLE COMPOSITE)---------------------------------------------------------- 1408.431   5.579    614.634
**CYCLE 7**
1 IDLE         1189.  9.310  8.080      81.     1.034      1229.  9.629     83.    0.042       51.650   0.404      3.518
2 0-25         1080.  6.450 10.100     501.     1.000      1080.  6.453    501.    0.244      263.676   1.574    122.316
3 30           4034.  4.920 11.000     420.     0.813      3283.  4.004    341.    0.118      387.398   0.472     40.334
4 30-15        2815.  4.750  6.200     178.     1.248      3514.  5.929    222.    0.062      217.877   0.367     13.776
5 15           1274.  9.430  8.080     117.     1.023      1303.  9.648    119.    0.050       65.179   0.482      5.985
6 15-30        1076.  4.960 11.110     787.     0.982      1057.  4.875    773.    0.455      481.214   2.218    351.966
7 50-20        6234.  4.820  4.720     165.     1.045      6520.  5.041    172.    0.029      189.096   0.146      5.004
SUM-------------(CYCLE COMPOSITE)---------------------------------------------------------- 1656.093   5.666    542.903
AVERAGE SUM OF CYCLES 6-7 ----------------------------------------------------------------- 1532.262   5.622    578.768

HONDA SL-100        RUN 2       8-23-72                      B - COLD CYCLE
------------------------------------------------------------------------------------------
CYCLE       CONCENTRATION AS DETERMINED        WEIGHTING          W   E   I   G   H   T   E  D
NUMBER         HC          CO        NO(K)        FACTOR            HC          CO          NO(K)
------------------------------------------------------------------------------------------
  1         951.100     3.981     858.214       0.0875          83.221      0.348       75.093
  2        1248.542     4.519     702.731       0.0875         109.247      0.395       61.489
  3        1512.015     5.573     593.287       0.0875         132.301      0.487       51.912
  4        1449.705     4.962     641.856       0.0875         126.849      0.434       56.162
  6        1408.431     5.579     614.634       0.3250         457.740      1.813      199.756
  7        1656.093     5.666     542.903       0.3250         538.230      1.841      176.443
SUM-----------(TRIP COMPOSITE)---------------------------- 1447.589      5.320      620.857

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
```

```
HONDA SL-100        RUN 4      8-24-72                          B - COLD CYCLE            K = 1.0000   W =      0.
------------------------------------------------------------------------------------------------------------------------
MODE           CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D     WEIGHTING        W E I G H T E D
                 HC      CO     CO2    NO(K)    FACTOR     HC      CO   NO(K)     FACTOR        HC      CO         NO(K)
------------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE          854.  7.760   9.480   117.      1.015      867.  7.878   118.      0.042       36.414  0.330       4.988
2 0-25          847.  4.190  11.640   678.      0.989      838.  4.147   671.      0.244      204.555  1.011     163.740
3 30           3059.  1.690  13.420   956.      0.825     2524.  1.394   789.      0.118      297.912  0.164      93.103
4 30-15        1849.  2.950   8.140   569.      1.248     2308.  3.683   710.      0.062      143.150  0.228      44.052
5 15            854.  7.480   9.920   193.      0.994      849.  7.437   191.      0.050       42.458  0.371       9.595
6 15-30         934.  3.970  11.920  1031.      0.972      908.  3.859  1002.      0.455      413.180  1.756     456.091
7 50-20        5224.  4.270   4.850   430.      1.148     5998.  4.903   493.      0.029      173.968  0.142      14.319
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------------ 1311.642  4.006     785.892
**CYCLE 2**
1 IDLE         1063.  6.620  10.150   129.      0.992     1055.  6.571   128.      0.042       44.315  0.275       5.377
2 0-25         1021.  4.490  11.450   605.      0.979     1000.  4.399   592.      0.244      244.112  1.073     144.650
3 30           3152.  3.090  12.720   802.      0.820     2586.  2.535   658.      0.118      305.225  0.299      77.661
4 30-15        2148.  5.250   6.780   410.      1.236     2656.  6.492   507.      0.062      164.697  0.402      31.436
5 15           1063.  7.200   9.590   214.      1.011     1075.  7.281   216.      0.050       53.750  0.364      10.820
6 15-30         976.  3.210  12.220   996.      0.974      951.  3.128   970.      0.455      432.766  1.423     441.634
7 50-20        5544.  5.070   4.530   305.      1.110     6158.  5.632   338.      0.029      178.605  0.163       9.825
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------------ 1423.472  4.002     721.407
**CYCLE 3**
1 IDLE         1232.  8.450   9.040   129.      0.993     1223.  8.394   128.      0.042       51.405  0.352       5.382
2 0-25         1066.  5.230  10.990   636.      0.982     1047.  5.139   624.      0.244      255.586  1.253     152.488
3 30           3432.  4.130  11.800   669.      0.825     2832.  3.408   552.      0.118      334.185  0.402      65.142
4 30-15        2504.  4.510   6.010   323.      1.321     3309.  5.961   426.      0.062      205.217  0.369      26.471
5 15           1175.  8.950   5.500   227.      1.017     1196.  9.110   231.      0.050       59.805  0.455      11.553
6 15-30        1031.  4.110  11.950  1117.      0.959      988.  3.941  1071.      0.455      449.914  1.793     487.443
7 50-20        5203.  4.990   4.670   233.      1.138     5924.  5.568   265.      0.029      171.809  0.161       7.693
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------------ 1527.924  4.788     756.177
**CYCLE 4**
1 IDLE         1189.  8.870   8.710   117.      1.004     1194.  8.913   117.      0.042       50.183  0.374       4.938
2 0-25         1144.  5.480  10.820   672.      0.980     1121.  5.370   658.      0.244      273.560  1.310     160.692
3 30           3013.  4.180  11.650   542.      0.853     2570.  3.566   462.      0.118      303.355  0.420      54.569
4 30-15        2203.  4.970   6.760   305.      1.247     2748.  6.199   380.      0.062      170.376  0.384      23.588
5 15           1161.  8.550   9.040   178.      0.995     1155.  8.509   177.      0.050       57.775  0.425       8.857
6 15-30        1050.  3.480  12.280  1024.      0.956     1004.  3.329   979.      0.455      457.131  1.515     445.812
7 50-20        5322.  4.860   4.380   267.      1.154     6145.  5.611   308.      0.029      178.208  0.162       8.940
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------------ 1490.592  4.593     707.399
AVERAGE SUM OF CYCLES 1-4 ----------------------------------------------------------------- 1438.407  4.347     742.719
```

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HONDA SL-100        RUN 4      8-24-72                          B - COLD CYCLE            K = 1.0000   W =      0.
------------------------------------------------------------------------------------------------------------------------
MODE           CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D     WEIGHTING        W E I G H T E D
                 HC      CO     CO2    NO(K)    FACTOR     HC      CO   NO(K)     FACTOR        HC      CO         NO(K)
------------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE          896.  3.650   8.820    93.      1.248     1118.  4.557   116.      0.042       46.988  0.191       4.877
2 0-25          941.  6.730  10.050   464.      1.004      945.  6.762   466.      0.244      230.697  1.649     113.755
3 30           3573.  5.350  10.550   406.      0.848     3032.  4.540   344.      0.118      357.847  0.535      40.662
4 30-15        2286.  5.450   6.080   199.      1.286     2940.  7.009   255.      0.062      182.289  0.434      15.868
5 15           1021.  9.900   7.850   141.      1.042     1064. 10.325   147.      0.050       53.243  0.516       7.352
6 15-30         934.  4.730  11.000   754.      1.008      942.  4.771   760.      0.455      428.703  2.171     346.084
7 50-20        5800.  4.900   4.330   231.      1.111     6447.  5.446   256.      0.029      186.974  0.157       7.446
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------------ 1486.744  5.657     536.046
**CYCLE 7**
1 IDLE         1189.  7.760   9.480   117.      0.990     1177.  7.683   115.      0.042       49.446  0.322       4.865
2 0-25         1098.  5.720  10.370   662.      1.005     1104.  5.753   665.      0.244      269.476  1.403     162.471
3 30           3105.  3.990  11.800   626.      0.845     2625.  3.373   529.      0.118      309.804  0.398      62.459
4 30-15        2322.  4.930   6.290   229.      1.287     2989.  6.347   294.      0.062      185.343  0.393      18.278
5 15           1161.  9.090   8.820   180.      0.991     1151.  9.016   178.      0.050       57.577  0.450       8.926
6 15-30        1047.  3.950  12.090  1203.      0.954      999.  3.769  1147.      0.455      454.573  1.714     522.303
7 50-20        5645.  5.030    .420   378.      1.112     6281.  5.596   420.      0.029      182.151  0.162      12.197
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------------ 1508.372  4.846     791.502
AVERAGE SUM OF CYCLES 6-7 ----------------------------------------------------------------- 1497.558  5.251     663.774
```

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HONDA SL-100        RUN 4      8-24-72                 B - COLD CYCLE
-----------------------------------------------------------------------------------------
CYCLE         CONCENTRATION AS DETERMINED      WEIGHTING        W  E  I  G  H  T  E  D
NUMBER          HC          CO        NO(K)       FACTOR          HC        CO         NO(K)
-----------------------------------------------------------------------------------------
  1          1311.642     4.006     785.892      0.0875       114.768     0.350      68.763
  2          1423.472     4.002     721.407      0.0875       124.553     0.350      63.123
  3          1527.924     4.788     756.177      0.0875       133.693     0.419      66.165
  4          1490.592     4.593     707.399      0.0875       130.426     0.401      61.897
  6          1486.744     5.657     536.046      0.3250       483.192     1.838     174.215
  7          1508.372     4.846     791.502      0.3250       490.221     1.575     257.238
SUM-----------(TRIP COMPOSITE)--------------------------------- 1476.855     4.935     691.405

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
```

```
HONDA SL-100        RUN 5      8-24-72                       B - COLD CYCLE          K = 1.0000   W =      0.
-----------------------------------------------------------------------------------------------------------------
             CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D    WEIGHTING        W E I G H T E D
MODE           HC      CO    CO2    NO(K)    FACTOR      HC      CO    NO(K)   FACTOR          HC      CO       NO(K)
-----------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE       1317.  8.760   8.820    70.     0.991     1305.  8.686    69.     0.042        54.851  0.364     2.915
2 0-25       1274.  3.840  11.520   780.     0.978     1246.  3.758   763.     0.244       304.227  0.916   185.261
3 30         2288.  2.320  13.170   982.     0.863     1974.  2.002   847.     0.118       233.007  0.236   100.005
4 30-15      2054.  3.460   7.260   507.     1.293     2657.  4.476   655.     0.062       164.747  0.277    40.665
5 15         1745.  7.760   9.480   178.     0.951     1659.  7.380   169.     0.050        82.988  0.369     8.465
6 15-30      1583.  3.400  12.290   686.     0.923     1462.  3.140   633.     0.455       665.228  1.428   288.279
7 50-20      4257.  5.260   5.110   564.     1.175     5003.  6.181   662.     0.029       145.090  0.179    19.722
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------- 1650.141  3.772   645.816
**CYCLE 2**
1 IDLE       2096.  7.480   9.590   141.     0.929     1948.  6.955   131.     0.042        81.857  0.292     5.506
2 0-25       1869.  3.940  11.260   736.     0.950     1777.  3.746   699.     0.244       433.650  0.914   170.768
3 30         2799.  1.590  13.420  1053.     0.841     2354.  1.337   885.     0.118       277.822  0.157   104.518
4 30-15      2200.  4.190   7.130   437.     1.249     2749.  5.237   546.     0.062       170.485  0.324    33.864
5 15         1731.  6.870  10.040   243.     0.944     1635.  6.491   229.     0.050        81.786  0.324    11.481
6 15-30      1487.  2.860  12.670   920.     0.923     1372.  2.640   849.     0.455       624.634  1.201   386.458
7 50-20      4383.  5.280   5.040   609.     1.168     5119.  6.167   711.     0.029       148.469  0.178    20.629
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------- 1816.707  3.393   733.227
**CYCLE 3**
1 IDLE       2008.  7.390   9.810   141.     0.925     1857.  6.836   130.     0.042        78.020  0.287     5.478
2 0-25       1822.  4.730  11.000   816.     0.945     1723.  4.473   771.     0.244       420.422  1.091   188.290
3 30         2512.  1.870  13.420   993.     0.849     2134.  1.588   843.     0.118       251.818  0.187    99.544
4 30-15      2064.  4.420   7.360   378.     1.228     2536.  5.431   464.     0.062       157.260  0.336    28.800
5 15         1644.  6.790  10.150   239.     0.946     1555.  6.426   226.     0.050        77.797  0.321    11.309
6 15-30      1494.  2.430  12.740  1282.     0.931     1391.  2.263  1194.     0.455       633.115  1.029   543.275
7 50-20      4470.  5.170   4.770   496.     1.190     5320.  6.153   590.     0.029       154.288  0.178    17.120
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------- 1772.723  3.432   893.819
**CYCLE 4**
1 IDLE       2008.  8.240   9.040   133.     0.945     1899.  7.794   125.     0.042        79.776  0.327     5.284
2 0-25       1800.  4.440  11.920   930.     0.901     1622.  4.002   838.     0.244       395.946  0.976   204.572
3 30         2377.  2.910  12.720   659.     0.866     2058.  2.520   570.     0.118       242.922  0.297    67.347
4 30-15      5024.  4.480   7.200   313.     0.975     4900.  4.369   305.     0.062       303.820  0.270    18.928
5 15         1601.  7.130  10.150   315.     0.938     1503.  6.694   295.     0.050        75.156  0.334    14.787
6 15-30      1444.  3.210  12.450  1275.     0.928     1340.  2.980  1183.     0.455       610.123  1.356   538.717
7 50-20      4479.  4.790   4.730   487.     1.212     5429.  5.806   590.     0.029       157.446  0.168    17.119
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------- 1865.192  3.731   866.756
AVERAGE SUM OF CYCLES 1-4 ------------------------------------------------------------ 1776.691  3.582   784.904
```

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HONDA SL-100        RUN 5      8-24-72                       B - COLD CYCLE          K = 1.0000   W =      0.
-----------------------------------------------------------------------------------------------------------------
             CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D    WEIGHTING        W E I G H T E D
MODE           HC      CO    CO2    NO(K)    FACTOR      HC      CO    NO(K)   FACTOR          HC      CO       NO(K)
-----------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE        979.  8.140   8.500    93.     1.064     1041.  8.661    98.     0.042        43.751  0.363     4.156
2 0-25       1052.  5.610  10.620   695.     0.995     1047.  5.586   692.     0.244       255.609  1.363   168.867
3 30         2318.  3.790  11.800   565.     0.895     2074.  3.392   505.     0.118       244.844  0.400    59.679
4 30-15      1892.  4.970   6.560   234.     1.307     2474.  6.499   305.     0.062       153.395  0.402    18.971
5 15         1444.  9.200   8.680   165.     0.977     1410.  8.989   161.     0.050        70.548  0.449     8.061
6 15-30      1274.  3.180  11.760  1276.     0.984     1254.  3.131  1256.     0.455       570.776  1.424   571.672
7 50-20      4345.  5.070   5.110   745.     1.175     5106.  5.958   875.     0.029       148.089  0.172    25.391
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------- 1487.016  4.577   856.801
**CYCLE 7**
1 IDLE       1703.  7.660   9.700   120.     0.943     1606.  7.226   113.     0.042        67.480  0.303     4.754
2 0-25       1509.  5.500  10.800   811.     0.955     1441.  5.253   774.     0.244       351.708  1.281   189.023
3 30         2437.  3.280  13.300   782.     0.825     2010.  2.706   645.     0.118       237.293  0.319    76.144
4 30-15      2084.  4.170   6.930   431.     1.287     2682.  5.367   554.     0.062       166.302  0.332    34.393
5 15         1487.  7.660   9.700   222.     0.957     1424.  7.338   212.     0.050        71.226  0.366    10.633
6 15-30      1339.  4.730  12.600  1215.     0.883     1183.  4.179  1073.     0.455       538.296  1.901   488.447
7 50-20      4615.  4.290   4.850   682.     1.210     5586.  5.192   825.     0.029       161.998  0.150    23.939
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------- 1594.306  4.656   827.336
AVERAGE SUM OF CYCLES 6-7 ------------------------------------------------------------ 1540.661  4.616   842.068
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HONDA SL-100        RUN 5      8-24-72                       B - COLD CYCLE
-------------------------------------------------------------------------------------
CYCLE        CONCENTRATION AS DETERMINED       WEIGHTING         W  E  I  G  H  T  E  D
NUMBER          HC          CO        NO(K)        FACTOR            HC         CO          NO(K)
-------------------------------------------------------------------------------------
  1          1650.141     3.772     645.816      0.0875          144.387    0.330       56.508
  2          1818.707     3.393     733.227      0.0875          159.136    0.296       64.157
  3          1772.723     3.432     893.819      0.0875          155.113    0.300       78.209
  4          1865.192     3.731     866.756      0.0875          163.204    0.326       75.841
  6          1487.016     4.577     856.801      0.3250          483.280    1.487      278.460
  7          1594.306     4.656     827.336      0.3250          518.149    1.513      268.884
SUM-----------(TRIP COMPOSITE)--------------------------- 1623.271    4.254      822.061

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
```

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KAWASAKI 125F-6     RUN 1      8-23-72                               B - COLD CYCLE              K = 1.0000    W =       0.
-------------------------------------------------------------------------------------------------------------------------------
                 CONCENTRATION   AS  MEASURED  DILUTION      A D J U S T E D    WEIGHTING          W E I G H T E D
MODE               HC      CO    CO2    NO(K)    FACTOR     HC       CO   NO(K)    FACTOR          HC      CO         NO(K)
-------------------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE            5072.  0.220   4.180    46.     1.484    7529.  0.326    68.     0.042        316.228  0.013        2.868
2 0-25            5257.  1.000   4.840   216.     1.316    6918.  1.316   284.     0.244       1688.147  0.321       69.362
3 30              3089.  1.070  10.370    58.     1.018    3145.  1.089    59.     0.118        371.128  0.128        6.968
4 30-15           4799.  1.910   6.160    50.     1.179    5658.  2.252    58.     0.062        350.815  0.139        3.655
5 15              3699.  0.230   8.500   117.     1.149    4253.  0.264   134.     0.050        212.671  0.013        6.726
6 15-30           3703.  1.760   8.940   219.     1.049    3885.  1.846   229.     0.455       1767.864  0.840      104.553
7 50-20           7340.  3.900   3.080   101.     1.119    8213.  4.364   113.     0.029        238.205  0.126        3.277
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------------- 4945.061  1.583      197.412
**CYCLE 2**
1 IDLE            5739.  2.400   4.400    70.     1.229    7053.  2.949    86.     0.042        296.237  0.123        3.613
2 0-25            4799.  1.080   8.330   277.     1.031    4951.  1.114   285.     0.244       1208.208  0.271       69.738
3 30              3182.  1.560  10.310    93.     0.998    3176.  1.557    92.     0.118        374.789  0.183       10.953
4 30-15           3879.  2.070   5.730    85.     1.323    5134.  2.740   112.     0.062        318.342  0.169        6.975
5 15              4261.  0.470   8.820    70.     1.061    4524.  0.499    74.     0.050        226.202  0.024        3.716
6 15-30           3960.  1.160   9.260   164.     1.027    4070.  1.171   168.     0.455       1852.021  0.533       76.699
7 50-20           8343.  3.310   2.130   142.     1.133    9454.  3.750   160.     0.029        274.178  0.108        4.666
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------------- 4549.981  1.416      176.363
**CYCLE 3**
1 IDLE            6751.  3.610   3.900    93.     1.115    7532.  4.027   103.     0.042        316.353  0.169        4.358
2 0-25            5691.  1.880   7.830   325.     0.972    5532.  1.827   315.     0.244       1349.851  0.445       77.086
3 30              3651.  1.620  10.150   105.     0.972    3552.  1.576   102.     0.118        419.165  0.185       12.054
4 30-15           4160.  2.330   5.790    96.     1.266    5269.  2.951   121.     0.062        326.686  0.182        7.538
5 15              4326.  1.910   8.080    93.     1.057    4576.  2.020    98.     0.050        228.812  0.101        4.918
6 15-30           4098.  1.460   9.120   258.     1.015    4162.  1.482   262.     0.455       1893.867  0.674      119.233
7 50-20           7786.  3.230   2.150   137.     1.191    9273.  3.847   163.     0.029        268.937  0.111        4.732
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------------- 4803.674  1.871      229.923
**CYCLE 4**
1 IDLE            6970.  3.180   4.110    93.     1.096    7640.  3.485   101.     0.042        320.899  0.146        4.281
2 0-25            6005.  1.880   8.090   288.     0.934    5612.  1.756   269.     0.244       1369.329  0.428       65.673
3 30              4083.  1.480  10.260   117.     0.940    3841.  1.392   110.     0.118        453.353  0.164       12.991
4 30-15           4587.  2.730   6.100    97.     1.167    5355.  3.187   113.     0.062        332.049  0.197        7.021
5 15              4424.  1.320   7.580    81.     1.113    4927.  1.470    90.     0.050        246.383  0.073        4.511
6 15-30           4285.  1.860   8.820   218.     1.008    4321.  1.875   219.     0.455       1966.245  0.853      100.033
7 50-20           7607.  3.220   2.090   137.     1.216    9256.  3.918   166.     0.029        268.450  0.113        4.834
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------------- 4956.711  1.977      199.346
AVERAGE SUM OF CYCLES 1-4 -------------------------------------------------------------------- 4813.857  1.712      200.761
```

```
KAWASAKI 125F-6     RUN 1      8-23-72                               B - COLD CYCLE              K = 1.0000    W =       0.
-------------------------------------------------------------------------------------------------------------------------------
                 CONCENTRATION   AS  MEASURED  DILUTION      A D J U S T E D    WEIGHTING          W E I G H T E D
MODE               HC      CO    CO2    NO(K)    FACTOR     HC       CO   NO(K)    FACTOR          HC      CO         NO(K)
-------------------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE            3938.  3.280   3.970    58.     1.470    5789.  4.822    85.     0.042        243.154  0.202        3.581
2 0-25            3870.  1.990   7.760   277.     1.121    4338.  2.230   310.     0.244       1058.560  0.544       75.767
3 30              3416.  1.340  10.260    93.     0.991    3388.  1.329    92.     0.118        399.799  0.156       10.884
4 30-15           4412.  2.820   5.720    86.     1.219    5378.  3.437   104.     0.062        333.451  0.213        6.499
5 15              4309.  1.080   8.500    70.     1.058    4562.  1.143    74.     0.050        228.135  0.057        3.706
6 15-30           4266.  1.830   8.840   268.     1.009    4306.  1.847   270.     0.455       1959.642  0.840      123.109
7 50-20           7662.  3.120   2.000   129.     1.225    9387.  3.822   158.     0.029        272.233  0.110        4.583
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------------- 4494.977  2.125      228.131
**CYCLE 7**
1 IDLE            7043.  3.090   3.970    93.     1.105    7782.  3.414   102.     0.042        326.883  0.143        4.316
2 0-25            6237.  1.760   7.850   304.     0.937    5847.  1.650   285.     0.244       1426.778  0.402       69.543
3 30              4621.  1.450  10.370   105.     0.901    4165.  1.307    94.     0.118        491.526  0.154       11.168
4 30-15           5202.  2.580   6.180    96.     1.107    5763.  2.858   106.     0.062        357.315  0.177        6.594
5 15              4621.  1.420   8.390    70.     1.029    4755.  1.461    72.     0.050        237.761  0.073        3.601
6 15-30           4526.  2.170   8.680   216.     0.989    4478.  2.147   213.     0.455       2037.816  0.977       97.253
7 50-20           7369.  3.150   1.990   130.     1.258    9272.  3.963   163.     0.029        268.899  0.114        4.743
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------------- 5146.981  2.042      197.220
AVERAGE SUM OF CYCLES 6-7 -------------------------------------------------------------------- 4820.979  2.084      212.676
```

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KAWASAKI 125F-6     RUN 1      8-23-72                          B - COLD CYCLE
------------------------------------------------------------------------------------------------
CYCLE         CONCENTRATION AS DETERMINED        WEIGHTING          W   E   I   G   H   T   E  D
NUMBER           HC          CO         NO(K)        FACTOR            HC          CO          NO(K)
------------------------------------------------------------------------------------------------
  1          4945.061      1.583      197.412       0.0875          432.692     0.138       17.273
  2          4549.981      1.416      176.363       0.0875          398.123     0.123       15.431
  3          4803.674      1.871      229.923       0.0875          420.321     0.163       20.118
  4          4956.711      1.977      199.346       0.0875          433.712     0.173       17.442
  6          4494.977      2.125      228.131       0.3250         1460.867     0.690       74.142
  7          5146.981      2.042      197.220       0.3250         1672.768     0.663       64.096
SUM-----------(TRIP COMPOSITE)---------------------------------  4818.486     1.953      208.506

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
```

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KAWASAKI 125F-6    RUN 3     8-24-72                    B - COLD CYCLE          K = 1.0000   W =      0.
------------------------------------------------------------------------------------------------------------
             CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D   WEIGHTING       W E I G H T E D
MODE           HC     CO    CO2    NO(K)    FACTOR      HC     CO   NO(K)   FACTOR        HC      CO      NO(K)
------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE       5326.  0.220   4.450    93.    1.406     7488.  0.309   130.    0.042     314.537  0.012     5.492
2 0-25       4877.  1.220   8.020   264.    1.043     5088.  1.272   275.    0.244    1241.608  0.310    67.210
3 30         3182.  1.220  10.480   129.    0.998     3176.  1.217   128.    0.118     374.789  0.143    15.194
4 30-15      4206.  2.250   8.840   108.    0.999     4203.  2.248   107.    0.062     260.637  0.139     6.692
5 15         3954.  0.240   8.520   105.    1.123     4440.  0.269   117.    0.050     222.043  0.013     5.896
6 15-30      3688.  0.490   9.130   237.    1.085     4003.  0.531   257.    0.455    1821.493  0.242   117.053
7 50-20      8352.  3.560   3.170   146.    1.037     8668.  3.695   151.    0.029     251.394  0.107     4.394
SUM------------(CYCLE COMPOSITE)-------------------------------------------------- 4486.503  0.969   221.933
**CYCLE 2**
1 IDLE       6001.  2.480   4.450   117.    1.191     7149.  2.954   139.    0.042     300.269  0.124     5.854
2 0-25       5087.  1.180   8.020   241.    1.028     5229.  1.213   247.    0.244    1276.081  0.296    60.455
3 30         3369.  1.070  10.480   129.    0.989     3333.  1.058   127.    0.118     393.377  0.124    15.062
4 30-15      4451.  2.070   8.840   122.    0.987     4395.  2.044   120.    0.062     272.539  0.126     7.470
5 15         4212.  0.680   8.520    97.    1.081     4554.  0.735   104.    0.050     227.735  0.036     5.244
6 15-30      4039.  0.820   9.130   196.    1.043     4212.  0.855   204.    0.455    1916.779  0.389    93.015
7 50-20      7799.  3.970   3.170   198.    1.067     8328.  4.239   211.    0.029     241.530  0.122     6.131
SUM------------(CYCLE COMPOSITE)-------------------------------------------------- 4628.314  1.220   193.234
**CYCLE 3**
1 IDLE       6668.  3.180   3.680   129.    1.162     7752.  3.697   149.    0.042     325.608  0.155     6.299
2 0-25       5711.  1.950   6.720   340.    1.045     5973.  2.039   355.    0.244    1457.526  0.497    86.772
3 30         3922.  1.110   9.960   137.    0.983     3855.  1.091   134.    0.118     454.928  0.128    15.891
4 30-15      4731.  1.840   6.910   136.    1.120     5301.  2.061   152.    0.062     328.697  0.127     9.448
5 15         4260.  1.320   8.520   105.    1.052     4482.  1.388   110.    0.050     224.116  0.069     5.523
6 15-30      4094.  1.690   9.210   187.    1.001     4100.  1.692   187.    0.455    1865.791  0.770    85.223
7 50-20      7824.  3.430   2.390   150.    1.154     9036.  3.961   173.    0.029     262.048  0.114     5.023
SUM------------(CYCLE COMPOSITE)-------------------------------------------------- 4918.716  1.864   214.183
**CYCLE 4**
1 IDLE       6624.  2.650   4.960   129.    1.078     7147.  2.859   139.    0.042     300.174  0.120     5.845
2 0-25       5958.  1.610   8.780   243.    0.905     5392.  1.457   219.    0.244    1315.847  0.355    53.687
3 30         4277.  1.190  10.890   141.    0.900     3850.  1.071   126.    0.118     454.413  0.126    14.980
4 30-15      5163.  1.280  10.770   136.    0.853     4407.  1.092   116.    0.062     273.255  0.067     7.197
5 15         4424.  1.520   8.820   105.    1.009     4467.  1.535   106.    0.050     223.388  0.076     5.301
6 15-30      4228.  0.910   9.470   273.    1.000     4230.  0.910   273.    0.455    1924.902  0.414   124.290
7 50-20      7558.  3.320   3.440   157.    1.093     8263.  3.629   171.    0.029     239.630  0.105     4.977
SUM------------(CYCLE COMPOSITE)-------------------------------------------------- 4731.613  1.266   216.261
AVERAGE SUM OF CYCLES 1-4 -------------------------------------------------------- 4691.286  1.330   211.403
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KAWASAKI 125F-6    RUN 3     8-24-72                    B - COLD CYCLE          K = 1.0000   W =      0.
------------------------------------------------------------------------------------------------------------
             CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D   WEIGHTING       W E I G H T E D
MODE           HC     CO    CO2    NO(K)    FACTOR      HC     CO   NO(K)   FACTOR        HC      CO      NO(K)
------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE       3479.  2.960   4.610   153.    1.479     5148.  4.232   226.    0.042     216.254  0.177     9.510
2 0-25       3447.  1.560   8.530   269.    1.112     3835.  1.735   299.    0.244     935.756  0.423    73.025
3 30         3213.  0.650  10.540   235.    1.011     3249.  0.657   237.    0.118     383.496  0.077    28.049
4 30-15      4104.  1.170   8.720   227.    1.055     4331.  1.234   239.    0.062     268.574  0.076    14.855
5 15         4034.  2.510   8.080   190.    1.059     4272.  2.658   201.    0.050     213.607  0.132    10.060
6 15-30      3975.  0.970   8.990   268.    1.053     4186.  1.021   282.    0.455    1904.783  0.464   128.423
7 50-20      7261.  3.820   3.930   288.    1.059     7695.  4.048   305.    0.029     223.160  0.117     8.851
SUM------------(CYCLE COMPOSITE)-------------------------------------------------- 4145.632  1.470   272.775
**CYCLE 7**
1 IDLE       6642.  2.910   4.560   252.    1.099     7302.  3.199   277.    0.042     306.708  0.134    11.636
2 0-25       6020.  1.670   8.080   533.    0.940     5662.  1.570   501.    0.244    1381.547  0.383   122.319
3 30         4621.  1.200  10.540   277.    0.898     4153.  1.078   248.    0.118     490.154  0.127    29.381
4 30-15      5302.  1.230   8.960   268.    0.947     5024.  1.165   253.    0.062     311.512  0.072    15.745
5 15         4654.  1.290   8.390   239.    1.031     4799.  1.330   246.    0.050     239.959  0.066    12.322
6 15-30      4458.  1.540   8.870   402.    1.003     4471.  1.544   403.    0.455    2034.755  0.702   183.483
7 30-20      7155.  3.360   2.930   297.    1.175     8409.  3.948   349.    0.029     243.866  0.114    10.122
SUM------------(CYCLE COMPOSITE)-------------------------------------------------- 5008.503  1.601   385.013
AVERAGE SUM OF CYCLES 6-7 -------------------------------------------------------- 4577.068  1.535   328.894

KAWASAKI 125F-6    RUN 3     8-24-72                    B - COLD CYCLE
------------------------------------------------------------------------------------
CYCLE       CONCENTRATION AS DETERMINED      WEIGHTING        W   E   I   G   H   T   E   D
NUMBER         HC          CO        NO(K)      FACTOR          HC          CO          NO(K)
------------------------------------------------------------------------------------
  1         4486.503     0.969     221.933     0.0875        392.569     0.084      19.419
  2         4628.314     1.220     193.234     0.0875        404.977     0.106      16.907
  3         4918.716     1.864     214.183     0.0875        430.387     0.163      18.741
  4         4731.615     1.266     216.261     0.0875        414.016     0.110      18.922
  6         4145.632     1.470     272.775     0.3250       1347.330     0.477      88.652
  7         5008.503     1.601     385.013     0.3250       1627.763     0.520     125.129
SUM------------(TRIP COMPOSITE)-------------------------------- 4617.044     1.463     287.772

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
```

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KAWASAKI 125F-6    RUN-6       8-24-72                          B - COLD CYCLE              K = 1.0000   W =      0.
------------------------------------------------------------------------------------------------------------------------
               CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D    WEIGHTING        W E I G H T E D
MODE             HC      CO     CO2    NO(K)    FACTOR      HC      CO    NO(K)    FACTOR       HC       CO        NO(K)
------------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE         5072.  0.450   5.100     58.     1.342     6807.  0.604     77.     0.042      285.931  0.025       3.269
2 0-25         4976.  2.430   6.160    108.     1.137     5659.  2.763    122.     0.244     1380.890  0.674      29.971
3 30           3970.  0.170   9.660    137.     1.033     4102.  0.175    141.     0.118      484.063  0.020      16.704
4 30-15        4577.  1.260   6.360     89.     1.215     5561.  1.531    108.     0.062      344.814  0.094       6.704
5 15           4083.  0.200   7.290     70.     1.229     5017.  0.245     86.     0.050      250.869  0.012       4.300
6 15-30        3990.  0.560   8.750    288.     1.087     4340.  0.587    313.     0.455     1974.914  0.267     142.550
7 50-20        6715.  3.130   2.440    108.     1.288     8649.  4.031    139.     0.029      250.831  0.116       4.034
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------- 4972.315  1.211     207.535
**CYCLE 2**
1 IDLE         6178.  2.310   4.250     81.     1.200     7417.  2.773     97.     0.042      311.528  0.116       4.084
2 0-25         5663.  1.320   7.770    214.     0.996     5645.  1.315    213.     0.244     1377.398  0.321      52.050
3 30           4440.  1.430   9.920     93.     0.939     4172.  1.343     87.     0.118      492.335  0.158      10.312
4 30-15        4712.  1.710   7.550     89.     1.074     5063.  1.837     95.     0.062      313.924  0.113       5.929
5 15           4293.  0.330   8.570     58.     1.084     4655.  0.357     62.     0.050      232.766  0.017       3.144
6 15-30        4191.  0.710   8.850    238.     1.055     4425.  0.749    251.     0.455     2013.659  0.341     114.352
7 50-20        6415.  3.340   2.510    115.     1.305     8373.  4.359    150.     0.029      242.839  0.126       4.353
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------- 4984.452  1.195     194.227
**CYCLE 3**
1 IDLE         6178.  2.400   4.450     93.     1.176     7269.  2.824    109.     0.042      305.334  0.118       4.596
2 0-25         5767.  1.450   7.590    331.     0.997     5749.  1.445    330.     0.244     1402.952  0.352      80.523
3 30           4704.  1.520   9.920    105.     0.920     4327.  1.398     96.     0.118      510.684  0.165      11.399
4 30-15        4714.  1.910   6.870    103.     1.122     5292.  2.144    115.     0.062      328.108  0.132       7.169
5 15           4571.  0.760   8.570     70.     1.044     4772.  0.793     73.     0.050      238.644  0.039       3.654
6 15-30        4349.  0.830   8.910    318.     1.034     4497.  0.858    328.     0.455     2046.262  0.390     149.623
7 50-20        6463.  3.210   2.250    120.     1.338     8649.  4.295    160.     0.029      250.824  0.124       4.657
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------- 5082.810  1.324     261.622
**CYCLE 4**
1 IDLE         6462.  2.680   4.280    105.     1.150     7437.  3.084    120.     0.042      312.355  0.129       5.075
2 0-25         6086.  1.670   7.560    264.     0.968     5895.  1.617    255.     0.244     1438.564  0.394      62.402
3 30           4971.  1.350  10.040    109.     0.901     4481.  1.217     98.     0.118      528.820  0.143      11.595
4 30-15        4789.  1.720   6.850    105.     1.125     5390.  1.936    118.     0.062      334.208  0.120       7.327
5 15           4871.  1.040   8.600     70.     1.008     4911.  1.048     70.     0.050      245.570  0.052       3.529
6 15-30        4591.  1.300   8.730    300.     1.011     4642.  1.314    303.     0.455     2112.465  0.598     138.039
7 50-20        6323.  3.280   2.200    122.     1.359     8593.  4.457    165.     0.029      249.213  0.129       4.808
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------- 5221.199  1.567     232.778
AVERAGE SUM OF CYCLES 1-4 -------------------------------------------------------------- 5065.194  1.324     224.040
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KAWASAKI 125F-6    RUN-6       8-24-72                          B - COLD CYCLE              K = 1.0000   W =      0.
------------------------------------------------------------------------------------------------------------------------
               CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D    WEIGHTING        W E I G H T E D
MODE             HC      CO     CO2    NO(K)    FACTOR      HC      CO    NO(K)    FACTOR       HC       CO        NO(K)
------------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE         4671.  2.910   4.060     46.     1.373     6413.  3.995     63.     0.042      269.386  0.167       2.652
2 0-25         4498.  1.660   7.280    302.     1.118     5029.  1.856    337.     0.244     1227.183  0.452      82.394
3 30           3810.  1.440   9.920     97.     0.982     3744.  1.415     95.     0.118      441.816  0.166      11.248
4 30-15        4879.  1.680   6.980     98.     1.107     5404.  1.861    108.     0.062      335.099  0.115       6.730
5 15           4131.  1.510   8.180     62.     1.082     4471.  1.634     67.     0.050      223.564  0.081       3.355
6 15-30        4154.  1.480   8.680    224.     1.042     4331.  1.543    233.     0.455     1970.759  0.702     106.271
7 50-20        7081.  3.220   2.150    116.     1.271     9000.  4.092    147.     0.029      261.018  0.118       4.275
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------- 4728.828  1.805     216.928
**CYCLE 7**
1 IDLE         6054.  2.970   4.040    105.     1.201     7276.  3.569    126.     0.042      305.627  0.149       5.300
2 0-25         5761.  1.570   7.450    261.     1.002     5778.  1.574    261.     0.244     1409.876  0.384      63.873
3 30           4888.  1.120  10.520    109.     0.886     4332.  0.992     96.     0.118      511.238  0.117      11.400
4 30-15        5869.  1.560   7.700    105.     0.978     5742.  1.526    102.     0.062      356.056  0.094       6.370
5 15           4971.  1.430   8.670     70.     0.982     4885.  1.405     68.     0.050      244.276  0.070       3.439
6 15-30        4848.  1.640   9.040    213.     0.960     4656.  1.575    204.     0.455     2118.774  0.716      93.089
7 30-20        7287.  3.500   3.040    117.     1.145     8346.  4.008    134.     0.029      242.037  0.116       3.886
SUM------------(CYCLE COMPOSITE)-------------------------------------------------------- 5187.887  1.649     187.360
AVERAGE SUM OF CYCLES 6-7 -------------------------------------------------------------- 4958.357  1.727     202.144
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KAWASAKI 125F-6    RUN-6       8-24-72                          B - COLD CYCLE
-------------------------------------------------------------------------------------
CYCLE       CONCENTRATION AS DETERMINED        WEIGHTING          W  E  I  G  H  T  E  D
NUMBER          HC          CO        NO(K)       FACTOR            HC          CO         NO(K)
-------------------------------------------------------------------------------------
  1         4972.315     1.211     207.535      0.0875         435.077     0.106      18.159
  2         4984.452     1.195     194.227      0.0875         436.139     0.104      16.994
  3         5082.810     1.324     261.622      0.0875         444.745     0.115      22.891
  4         5221.199     1.567     232.778      0.0875         456.854     0.137      20.368
  6         4728.828     1.805     216.928      0.3250        1536.869     0.586      70.501
  7         5187.887     1.649     187.360      0.3250        1686.063     0.535      60.892
SUM------------(TRIP COMPOSITE)----------------------------- 4995.750     1.586     209.808

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
```

```
SUZUKI              RUN  2                                    B - COLD CYCLE          K = 1.0000    W =    489.
-------------------------------------------------------------------------------------------------------------------
                 CONCENTRATION  AS  MEASURED  DILUTION        A D J U S T E D   WEIGHTING         W E I G H T E D
MODF                HC      CO     CO2    NO(K)    FACTOR       HC      CO    NO(K)    FACTOR          HC       CO        NO(K)
-------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE           8462.  2.730   3.970     69.     1.001       8477.  2.734     69.     0.042       356.043  0.114      2.903
2 0-25           7047.  4.190   5.460     69.     0.956       6737.  4.006     65.     0.244      1643.985  0.977     16.096
3 30             6969.  5.650   4.720     69.     0.962       6704.  5.435     66.     0.118       791.158  0.641      7.833
4 30-15          8261.  4.080   3.490     81.     1.003       8288.  4.093     81.     0.062       513.887  0.253      5.038
5 15             7172.  3.090   6.180     81.     0.937       6721.  2.896     75.     0.050       336.098  0.144      3.795
6 15-30          6268.  5.630   5.880     81.     0.937       5877.  5.278     75.     0.455      2674.078  2.401     34.556
7 50-20          8186.  3.690   2.880    105.     1.068       8749.  3.944    112.     0.029       253.740  0.114      3.254
SUM------------(CYCLE COMPOSITE)----------------------------------------------------------- 6568.992  4.648     73.479
**CYCLE 2**
1 IDLE           7827.  2.910   4.480    117.     1.007       7887.  2.932    117.     0.042       331.289  0.123      4.952
2 0-25           6714.  3.410   6.790    117.     0.920       6182.  3.140    107.     0.244      1508.570  0.766     26.288
3 30             5429.  4.880   6.740    117.     0.963       5232.  4.703    112.     0.118       617.484  0.555     13.307
4 30-15          5677.  4.120   5.730    117.     1.041       5913.  4.291    121.     0.062       366.609  0.266      7.555
5 15             5949.  2.520   7.080    105.     0.982       5842.  2.474    103.     0.050       292.112  0.123      5.155
6 15-30          5427.  4.560   7.180    117.     0.946       5136.  4.315    110.     0.455      2336.940  1.963     50.381
7 50-20          7173.  4.010   3.950    117.     1.058       7590.  4.243    123.     0.029       220.134  0.123      3.590
SUM------------(CYCLE COMPOSITE)----------------------------------------------------------- 5673.140  3.920    111.232
**CYCLE 3**
1 IDLE           7581.  3.140   4.480    129.     1.018       7720.  3.197    131.     0.042       324.272  0.134      5.517
2 0-25           6615.  4.300   6.390    117.     0.924       6115.  3.975    108.     0.244      1492.194  0.969     26.392
3 30             5566.  5.800   6.530    117.     0.939       5226.  5.446    109.     0.118       616.751  0.642     12.964
4 30-15          5831.  4.010   5.810    117.     1.027       5991.  4.120    120.     0.062       371.449  0.255      7.453
5 15             5739.  2.910   7.040    117.     0.986       5663.  2.871    115.     0.050       283.178  0.143      5.773
6 15-30          5363.  5.150   6.900    117.     0.949       5093.  4.891    111.     0.455      2317.567  2.225     50.560
7 50-20          6724.  4.210   4.200    117.     1.068       7186.  4.499    125.     0.029       208.407  0.130      3.626
SUM------------(CYCLE COMPOSITE)----------------------------------------------------------- 5613.820  4.502    112.287
**CYCLE 4**
1 IDLE           7301.  3.180   4.480    153.     1.039       7586.  3.304    158.     0.042       318.615  0.138      6.676
2 0-25           6008.  3.940   6.480    117.     0.970       5831.  3.824    113.     0.244      1422.907  0.933     27.709
3 30             5704.  5.530   6.650    153.     0.930       5310.  5.148    142.     0.118       626.603  0.607     16.807
4 30-15          5906.  4.090   5.670    153.     1.028       6076.  4.207    157.     0.062       376.734  0.260      9.759
5 15             5756.  3.170   6.920    117.     0.984       5669.  3.122    115.     0.050       283.470  0.156      5.761
6 15-30          5008.  5.290   6.810    117.     0.975       4885.  5.160    114.     0.455      2222.892  2.348     51.932
7 50-20          5490.  4.160   4.460    117.     1.162       6384.  4.837    136.     0.029       185.139  0.140      3.945
SUM------------(CYCLE COMPOSITE)----------------------------------------------------------- 5436.363  4.584    122.594
AVERAGE SUM OF CYCLES 1-4 ----------------------------------------------------------------- 5823.079  4.414    104.898
```

```
SUZUKI              RUN  2                                    B - COLD CYCLE          K = 1.0000    W =    489.
-------------------------------------------------------------------------------------------------------------------
                 CONCENTRATION  AS  MEASURED  DILUTION        A D J U S T E D   WEIGHTING         W E I G H T E D
MODE                HC      CO     CO2    NO(K)    FACTOR       HC      CO    NO(K)    FACTOR          HC       CO        NO(K)
-------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE           6969.  3.710   5.360     93.     0.983       6854.  3.649     91.     0.042       287.902  0.153      3.842
2 0-25           6334.  5.330   6.890     93.     0.884       5601.  4.713     82.     0.244      1366.801  1.150     20.068
3 30             5531.  5.130   7.110    117.     0.926       5125.  4.753    108.     0.118       604.757  0.560     12.792
4 30-15          5157.  4.030   6.450    117.     1.033       5328.  4.163    120.     0.062       330.337  0.258      7.494
5 15             5635.  3.250   6.830     93.     0.997       5619.  3.240     92.     0.050       280.959  0.162      4.636
6 15-30          5397.  5.010   6.440    105.     0.981       5296.  4.917    103.     0.455      2410.131  2.237     46.889
7 50-20          6569.  4.270   4.230    129.     1.077       7076.  4.600    138.     0.029       205.227  0.133      4.030
SUM------------(CYCLE COMPOSITE)----------------------------------------------------------- 5486.118  4.655     99.754
**CYCLE 7**
1 IDLE           7134.  3.370   4.560    141.     1.039       7415.  3.502    146.     0.042       311.447  0.147      6.155
2 0-25           6598.  4.520   5.690    144.     0.961       6345.  4.347    138.     0.244      1548.419  1.060     33.793
3 30             5983.  5.910   6.100    141.     0.934       5590.  5.522    131.     0.118       659.737  0.651     15.547
4 30-15          6232.  4.150   5.170    129.     1.037       6465.  4.305    133.     0.062       400.883  0.266      8.298
5 15             5773.  3.520   6.860    117.     0.976       5635.  3.435    114.     0.050       281.754  0.171      5.710
6 15-30          5515.  5.420   6.630    117.     0.947       5227.  5.137    110.     0.455      2378.709  2.337     50.464
7 50-20          6947.  3.750   4.160    125.     1.071       7440.  4.016    133.     0.029       215.782  0.116      3.882
SUM------------(CYCLE COMPOSITE)----------------------------------------------------------- 5796.734  4.752    123.852
AVERAGE SUM OF CYCLES 6-7 ----------------------------------------------------------------- 5641.426  4.703    111.803
```

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SUZUKI              RUN  2                                    B - COLD CYCLE
---------------------------------------------------------------------------------------
CYCLE        CONCENTRATION AS DETERMINED        WEIGHTING          W   E   I   G   H   T   E   D
NUMBER           HC          CO        NO(K)        FACTOR            HC         CO          NO(K)
---------------------------------------------------------------------------------------
  1          6568.992      4.648      73.479       0.0875          574.786    0.406          6.429
  2          5673.140      3.920     111.232       0.0875          496.399    0.343          9.732
  3          5613.820      4.502     112.287       0.0875          491.209    0.393          9.825
  4          5436.363      4.584     122.594       0.0875          475.681    0.401         10.726
  6          5486.118      4.655      99.754       0.3250         1782.988    1.512         32.420
  7          5796.734      4.752     123.852       0.3250         1883.938    1.544         40.252
SUM------------(TRIP COMPOSITE)------------------------------- 5705.004    4.602        109.386
```

```
DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
```

```
SUZUKI           RUN-3                                    B - COLD CYCLE          K = 1.0000   W =   489.
---------------------------------------------------------------------------------------------------------------
           CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D   WEIGHTING        W E I G H T E D
MODE         HC      CO     CO2   NO(K)    FACTOR     HC       CO   NO(K)   FACTOR         HC       CO        NO(K)
---------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE     7676.  2.720   5.050    57.     0.986    7571.  2.682    56.    0.042      318.003  0.112      2.361
2 0-25     6546.  2.320   5.570    57.     1.050    6878.  2.437    59.    0.244     1678.281  0.594     14.613
3 30       6966.  3.400   4.880    57.     1.028    7161.  3.495    58.    0.118      845.110  0.412      6.915
4 30-15    7614.  3.420   4.980    61.     0.972    7403.  3.325    59.    0.062      458.990  0.206      3.677
5 15       6427.  2.650   7.080    69.     0.944    6072.  2.503    65.    0.050      303.631  0.125      3.259
6 15-30    5618.  2.600   7.610    69.     0.968    5438.  2.517    66.    0.455     2474.705  1.145     30.394
7 50-20    7842.  3.340   4.260    72.     1.006    7896.  3.363    72.    0.029      229.007  0.097      2.102
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------- 6307.731  2.694     63.324
**CYCLE 2**
1 IDLE     8082.  2.950   4.800    93.     0.966    7810.  2.850    89.    0.042      328.051  0.119      3.774
2 0-25     6695.  2.910   5.040    93.     1.056    7072.  3.074    98.    0.244     1725.746  0.750     23.972
3 30       5583.  3.420   6.200    93.     1.040    5807.  3.557    96.    0.118      685.276  0.419     11.415
4 30-15    6256.  3.370   6.360    93.     0.979    6128.  3.301    91.    0.062      379.971  0.204      5.648
5 15       6053.  3.000   6.830    93.     0.975    5903.  2.925    90.    0.050      295.174  0.146      4.535
6 15-30    5474.  2.750   7.560    93.     0.976    5346.  2.685    90.    0.455     2432.471  1.222     41.326
7 50-20    7077.  3.320   4.520   105.     1.048    7423.  3.482   110.    0.029      215.282  0.100      3.194
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------- 6061.974  2.965     93.866
**CYCLE 3**
1 IDLE     7751.  3.040 ' 4.720   117.     0.992    7692.  3.016   116.    0.042      323.067  0.126      4.876
2 0-25     6152.  3.020   5.270   117.     1.080    6645.  3.262   126.    0.244     1621.388  0.795     30.835
3 30       5480.  3.400   6.410   105.     1.033    5664.  3.514   108.    0.118      668.378  0.414     12.806
4 30-15    5770.  3.370   6.870   105.     0.980    5658.  3.304   102.    0.062      350.806  0.204      6.383
5 15       5756.  3.090   6.090    93.     1.046    6025.  3.234    97.    0.050      301.274  0.161      4.867
6 15-30    5395.  2.850   7.340    93.     0.993    5361.  2.832    92.    0.455     2439.315  1.288     42.049
7 50-20    7077.  3.370   4.440   105.     1.053    7453.  3.549   110.    0.029      216.142  0.102      3.206
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------- 5920.371  3.095    105.026
**CYCLE 4**
1 IDLE     7581.  3.040   4.690   117.     1.007    7634.  3.061   117.    0.042      320.669  0.128      4.948
2 0-25     6882.  3.010   4.870   117.     1.050    7227.  3.160   122.    0.244     1763.419  0.771     29.979
3 30       5635.  3.500   6.470   105.     1.013    5711.  3.547   106.    0.118      673.956  0.418     12.558
4 30-15    5946.  2.810   6.980   117.     0.979    5822.  2.751   114.    0.062      361.016  0.170      7.103
5 15       5791.  3.230   6.120   105.     1.036    6002.  3.347   108.    0.050      300.120  0.167      5.441
6 15-30    5421.  2.690   7.330    93.     0.997    5409.  2.684    92.    0.455     2461.516  1.221     42.228
7 50-20    6819.  3.340   4.330   105.     1.084    7398.  3.623   113.    0.029      214.552  0.105      3.303
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------- 6095.250  2.983    105.564
AVERAGE SUM OF CYCLES 1-4 ------------------------------------------------------- 6096.332  2.934     91.945


SUZUKI           RUN-3                                    B - COLD CYCLE          K = 1.0000   W =   489.
---------------------------------------------------------------------------------------------------------------
           CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D   WEIGHTING        W E I G H T E D
MODE         HC      CO     CO2   NO(K)    FACTOR     HC       CO   NO(K)   FACTOR         HC       CO        NO(K)
---------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE     5548.  3.140   4.720    46.     1.180    6549.  3.707    54.    0.042      275.099  0.155      2.280
2 0-25     4461.  3.040   4.460    57.     1.342    5990.  4.082    76.    0.244     1461.677  0.996     18.676
3 30       4836.  3.520   6.800    69.     1.052    5087.  3.703    72.    0.118      600.338  0.436      8.565
4 30-15    5450.  3.460   6.990    69.     0.992    5410.  3.434    68.    0.062      335.447  0.212      4.246
5 15       5309.  3.180   6.680    69.     1.035    5497.  3.292    71.    0.050      274.857  0.164      3.572
6 15-30    5079.  2.780   7.320    69.     1.021    5188.  2.839    70.    0.455     2360.545  1.292     32.068
7 50-20    7390.  3.460   3.630    93.     1.086    8031.  3.760   101.    0.029      232.924  0.109      2.931
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------- 5540.891  3.367     72.342
**CYCLE 7**
1 IDLE     7525.  3.140   4.640   105.     1.011    7610.  3.175   106.    0.042      319.643  0.133      4.460
2 0-25     6635.  3.120   4.260    93.     1.116    7408.  3.483   103.    0.244     1807.715  0.850     25.337
3 30       5825.  3.670   5.850   105.     1.037    6043.  3.807   108.    0.118      713.120  0.449     12.854
4 30-15    5958.  3.470   6.890   105.     0.962    5736.  3.341   101.    0.062      355.668  0.207      6.268
5 15       5739.  3.040   5.430    81.     1.102    6329.  3.352    89.    0.050      316.453  0.167      4.466
6 15-30    5440.  2.880   7.250    69.     0.995    5415.  2.867    68.    0.455     2464.119  1.304     31.254
7 50-20    6726.  3.360   4.280    93.     1.096    7374.  3.684   101.    0.029      213.873  0.106      2.957
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------- 6190.595  3.218     87.598
AVERAGE SUM OF CYCLES 6-7 ------------------------------------------------------- 5865.743  3.293     79.970

SUZUKI           RUN-3                                    B - COLD CYCLE
--------------------------------------------------------------------------------
CYCLE      CONCENTRATION AS DETERMINED       WEIGHTING       W   E   I   G   H   T   E   D
NUMBER        HC         CO        NO(K)       FACTOR        HC          CO          NO(K)
--------------------------------------------------------------------------------
  1        6307.731    2.694      63.324      0.0875       551.926     0.235        5.540
  2        6061.974    2.963      93.866      0.0875       530.422     0.259        8.213
  3        5920.371    3.095     105.026      0.0875       518.032     0.270        9.189
  4        6095.250    2.983     105.564      0.0875       533.334     0.261        9.236
  6        5540.891    3.367      72.342      0.3250      1800.789     1.094       23.511
  7        6190.595    3.218      87.598      0.3250      2011.943     1.046       28.469
SUM-----------(TRIP COMPOSITE)----------------------------- 5946.449    3.167       84.161
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```
DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
```

```
SUZUKI T250        RUN-4                                          - COLD CYCLE          K = 1.0000   W =   489.
-------------------------------------------------------------------------------------------------------------------
MODE          CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D   WEIGHTING        W E I G H T E D
                 HC      CO     CO2    NO(K)    FACTOR     HC      CO    NO(K)    FACTOR         HC       CO        NO(K)
-------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE        8526.   2.970   3.500    55.     1.021    8710.   3.036    56.     0.042      365.835   0.127      2.359
2 0-25        8366.   3.200   4.920    51.     0.932    7798.   2.982    47.     0.244     1902.820   0.727     11.599
3 30          7179.   6.110   4.540    60.     0.944    6782.   5.772    56.     0.118      800.300   0.681      6.688
4 30-15       6756.   5.270   4.490    58.     1.005    6792.   5.298    58.     0.062      421.152   0.328      3.615
5 15          8606.   4.120   5.020    64.     0.885    7620.   3.648    56.     0.050      381.041   0.182      2.833
6 15-30       7586.   4.730   5.610    64.     0.896    6803.   4.242    57.     0.455     3095.559   1.930     26.115
7 50-20       8831.   3.800   2.360    77.     1.050    9280.   3.995    80.     0.029      269.138   0.115      2.346
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------ 7235.848   4.093     55.560
**CYCLE 2**
1 IDLE       12016.   3.750   3.050   103.     0.809    9732.   3.037    83.     0.042      408.760   0.127      3.503
2 0-25       10118.   4.600   4.160    87.     0.833    8437.   3.836    72.     0.244     2058.812   0.936     17.702
3 30          8865.   6.020   3.470    86.     0.903    8006.   5.437    77.     0.118      944.800   0.641      9.165
4 30-15       8556.   6.020   3.590    81.     0.915    7831.   5.510    74.     0.062      485.581   0.341      4.597
5 15          8925.   4.160   5.050    77.     0.864    7717.   3.597    66.     0.050      385.868   0.179      3.329
6 15-30       8017.   5.890   5.570    77.     0.844    6769.   4.973    65.     0.455     3079.895   2.262     29.581
7 50-20       8439.   3.710   2.900    87.     1.045    8822.   3.878    90.     0.029      255.863   0.112      2.637
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------ 7619.582   4.601     70.517
**CYCLF 3**
1 IDLE       12711.   3.560   3.100   103.     0.779    9904.   2.774    80.     0.042      416.006   0.116      3.370
2 0-25       10951.   4.760   4.200    95.     0.787    8626.   3.749    74.     0.244     2104.876   0.914     18.259
3 30          8986.   6.640   4.080    90.     0.847    7617.   5.628    76.     0.118      898.868   0.664      9.002
4 30-15       8674.   6.160   3.940    90.     0.884    7674.   5.450    79.     0.062      475.833   0.337      4.937
5 15          9977.   4.400   4.870    77.     0.812    8106.   3.575    62.     0.050      405.338   0.178      3.128
6 15-30       8584.   5.650   5.060    77.     0.845    7255.   4.775    65.     0.455     3301.111   2.172     29.611
7 50-20       8613.   4.230   3.090    89.     0.999    8608.   4.227    88.     0.029      249.655   0.122      2.579
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------ 7851.691   4.507     70.890
**CYCLE 4**
1 IDLF       10039.   3.700   3.200   103.     0.912    9159.   3.375    93.     0.042      384.703   0.141      3.947
2 0-25        9644.   5.000   3.810    91.     0.866    8360.   4.334    78.     0.244     2040.024   1.057     19.249
3 30          8506.   6.620   4.190    90.     0.868    7391.   5.752    78.     0.118      872.189   0.678      9.228
4 30-15       8339.   6.300   4.180    90.     0.887    7401.   5.591    79.     0.062      458.907   0.346      4.952
5 15          9394.   4.360   5.010    90.     0.836    7857.   3.646    75.     0.050      392.872   0.182      3.763
6 15-30       8219.   5.740   5.650    90.     0.833    6850.   4.784    75.     0.455     3116.994   2.176     34.131
7 50-20       8675.   4.350   2.760    90.     1.013    8793.   4.409    91.     0.029      255.022   0.127      2.645
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------ 7520.713   4.712     77.919
AVERAGE SUM OF CYCLES 1-4 ---------------------------------------------------------- 7556.958   4.478     68.721
```

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SUZUKI T250        RUN-4                                          - COLD CYCLE          K = 1.0000   W =   489.
-------------------------------------------------------------------------------------------------------------------
MODE          CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D   WEIGHTING        W E I G H T E D
                 HC      CO     CO2    NO(K)    FACTOR     HC      CO    NO(K)    FACTOR         HC       CO        NO(K)
-------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLF        5161.   4.020   3.230   103.     1.340    6920.   5.390   138.     0.042      290.649   0.226      5.800
2 0-25        5329.   5.140   4.130    90.     1.164    6203.   5.983   104.     0.244     1513.730   1.460     25.564
3 30          5281.   7.180   4.450   103.     1.055    5571.   7.575   108.     0.118      657.460   0.893     12.823
4 30-15       5303.   6.000   4.770   103.     1.074    5696.   6.445   110.     0.062      353.212   0.399      6.860
5 15          6957.   4.540   5.050   103.     0.977    6800.   4.437   100.     0.050      340.027   0.221      5.034
6 15-30       6210.   5.500   5.880    98.     0.945    5871.   5.199    92.     0.455     2671.383   2.365     42.157
7 50-20       7490.   4.530   2.450    95.     1.132    8481.   5.129   107.     0.029      245.977   0.148      3.119
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------ 6072.442   5.716    101.360
**CYCLE 7**
1 IDLE        9046.   3.890   3.130   117.     0.976    8835.   3.799   114.     0.042      371.110   0.159      4.799
2 0-25        8793.   5.160   4.460   107.     0.876    7710.   4.524    93.     0.244     1881.277   1.103     22.892
3 30          7747.   7.150   4.130   103.     0.902    6989.   6.450    92.     0.118      824.745   0.761     10.965
4 30-15       7825.   6.140   4.130   117.     0.926    7249.   5.688   108.     0.062      449.471   0.352      6.720
5 15          8885.   4.790   4.600   103.     0.873    7765.   4.186    90.     0.050      388.264   0.209      4.500
6 15-30       7962.   5.880   5.220   103.     0.865    6888.   5.087    89.     0.455     3134.400   2.314     40.548
7 50-20       8527.   4.740   2.280    98.     1.046    8921.   4.958   102.     0.029      258.717   0.143      2.973
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------ 7307.987   5.045     93.401
AVERAGE SUM OF CYCLES 6-7 ---------------------------------------------------------- 6690.215   5.380     97.390
```

```
SUZUKI T250        RUN-4                                          - COLD CYCLE
------------------------------------------------------------------------------------
CYCLE        CONCENTRATION AS DETERMINED      WEIGHTING          W  E  I  G  H  T  E  D
NUMBER          HC         CO        NO(K)       FACTOR            HC         CO          NO(K)
------------------------------------------------------------------------------------
  1          7235.848     4.093      55.560      0.0875          633.136     0.358        4.861
  2          7619.582     4.601      70.517      0.0875          666.713     0.402        6.170
  3          7851.691     4.507      70.890      0.0875          687.022     0.394        6.202
  4          7520.713     4.712      77.919      0.0875          658.062     0.412        6.817
  6          6072.442     5.716     101.360      0.3250         1973.543     1.857       32.942
  7          7307.987     5.045      93.401      0.3250         2375.096     1.639       30.355
SUM-----------(TRIP COMPOSITE)-----------------------------------  6993.575     5.065       87.350
```

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)

```
SUZUKI T250        RUN-5                                    S - COLD CYCLE          K = 1.0000    W =    489.
----------------------------------------------------------------------------------------------------------------
               CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D    WEIGHTING        W E I G H T E D
MODE             HC      CO     CO2    NO(K)    FACTOR     HC      CO    NO(K)    FACTOR       HC        CO       NO(K)
----------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE         8805.   2.610   3.130    77.     1.039     9155.   2.713    80.     0.042     384.544   0.113      3.362
2 0-25         9011.   2.870   3.870    77.     0.964     8689.   2.767    74.     0.244    2120.181   0.675     18.117
3 30           8152.   5.980   3.300    77.     0.960     7831.   5.744    73.     0.118     924.070   0.677      8.728
4 30-15        7957.   5.610   3.270    77.     0.988     7865.   5.545    76.     0.062     487.664   0.343      4.719
5 15           9712.   3.780   4.450    77.     0.861     8367.   3.256    66.     0.050     418.397   0.162      3.317
6 15-30        7840.   4.840   5.040    77.     0.910     7134.   4.406    70.     0.455    3247.551   2.004     31.895
7 50-20        7440.   4.000   2.690    88.     1.139     8474.   4.557   100.     0.029     245.852   0.132      2.907
SUM------------(CYCLE COMPOSITE)---------------------------------------------------   7828.263   4.110     73.048
**CYCLE 2**
1 IDLE         8387.   3.190   2.790    81.     1.078     9046.   3.440    87.     0.042     379.952   0.144      3.669
2 0-25         8057.   3.590   3.630    77.     1.026     8269.   3.684    79.     0.244    2017.877   0.899     19.284
3 30           6993.   5.960   3.560    77.     1.028     7195.   6.132    79.     0.118     849.038   0.723      9.348
4 30-15        6760.   5.100   3.680    77.     1.071     7244.   5.465    82.     0.062     449.141   0.338      5.115
5 15           7518.   3.730   4.840    77.     0.978     7353.   3.648    75.     0.050     367.673   0.182      3.765
6 15-30        6561.   4.180   5.960    77.     0.957     6285.   4.004    73.     0.455    2859.840   1.821     33.563
7 50-20        6452.   4.240   3.370    89.     1.163     7509.   4.934   103.     0.029     217.774   0.143      3.004
SUM------------(CYCLE COMPOSITE)---------------------------------------------------   7141.296   4.253     77.751
**CYCLE 3**
1 IDLE         6085.   2.570   3.130    77.     1.319     8030.   3.391   101.     0.042     337.292   0.142      4.268
2 0-25         5983.   3.420   3.900    77.     1.201     7186.   4.107    92.     0.244    1753.519   1.002     22.567
3 30           5419.   5.490   4.840    90.     1.079     5847.   5.924    97.     0.118     690.001   0.699     11.459
4 30-15        5355.   5.430   4.420    89.     1.122     6010.   6.094    99.     0.062     372.657   0.377      6.193
5 15           5610.   3.440   4.910    77.     1.142     6410.   3.931    87.     0.050     320.538   0.196      4.399
6 15-30        5161.   3.750   6.030    77.     1.075     5551.   4.034    82.     0.455    2526.151   1.835     37.689
7 50-20        6092.   4.420   3.160    77.     1.213     7392.   5.363    93.     0.029     214.378   0.155      2.709
SUM------------(CYCLE COMPOSITE)---------------------------------------------------   6214.540   4.409     89.287
**CYCLE 4**
1 IDLE         5505.   2.280   3.020    77.     1.434     7898.   3.271   110.     0.042     331.757   0.137      4.640
2 0-25         5409.   2.910   4.090    77.     1.273     6887.   3.705    98.     0.244    1680.645   0.904     23.924
3 30           4991.   5.190   5.500   103.     1.075     5366.   5.580   110.     0.118     633.253   0.658     13.068
4 30-15        4575.   4.900   5.890    89.     1.091     4994.   5.349    97.     0.062     309.684   0.331      6.024
5 15           4923.   2.820   5.750    77.     1.162     5721.   3.277    89.     0.050     286.064   0.163      4.474
6 15-30        4679.   4.010   6.040    77.     1.107     5179.   4.439    85.     0.455    2356.760   2.019     38.784
7 50-20        5819.   4.870   3.350    84.     1.201     6990.   5.850   100.     0.029     202.732   0.169      2.926
SUM------------(CYCLE COMPOSITE)---------------------------------------------------   5800.906   4.385     93.843
AVERAGE SUM OF CYCLES 1-4 ---------------------------------------------------------   6746.251   4.289     83.482
```

```
SUZUKI T250        RUN-5                                    S - COLD CYCLE          K = 1.0000    W =    489.
----------------------------------------------------------------------------------------------------------------
               CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D    WEIGHTING        W E I G H T E D
MODE             HC      CO     CO2    NO(K)    FACTOR     HC      CO    NO(K)    FACTOR       HC        CO       NO(K)
----------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE         3487.   2.440   3.040    77.     1.806     6299.   4.408   139.     0.042     264.589   0.185      5.842
2 0-25         3926.   3.700   4.910    77.     1.318     5175.   4.877   101.     0.244    1262.735   1.190     24.765
3 30           4291.   5.470   5.800   103.     1.101     4724.   6.022   113.     0.118     557.502   0.710     13.382
4 30-15        4171.   5.010   5.510    89.     1.158     4830.   5.802   103.     0.062     299.506   0.359      6.390
5 15           4428.   2.820   6.050    77.     1.184     5244.   3.340    91.     0.050     262.231   0.167      4.560
6 15-30        4562.   3.960   6.000    77.     1.123     5125.   4.448    86.     0.455    2331.904   2.024     39.359
7 50-20        5920.   4.030   2.660    90.     1.310     7755.   5.279   117.     0.029     224.902   0.153      3.419
SUM------------(CYCLE COMPOSITE)------------------------------------  -------------   5203.371   4.789     97.719
**CYCLE 7**
1 IDLE         5350.   2.080   3.060    77.     1.467     7853.   3.053   113.     0.042     329.839   0.128      4.747
2 0-25         4861.   3.170   3.460    80.     1.408     6846.   4.464   112.     0.244    1670.560   1.089     27.493
3 30           4991.   5.360   5.500   103.     1.068     5332.   5.727   110.     0.118     629.287   0.675     12.986
4 30-15        4839.   5.120   5.340    99.     1.104     5345.   5.655   109.     0.062     331.420   0.350      6.780
5 15           5123.   3.010   6.310    77.     1.086     5565.   3.269    83.     0.050     278.260   0.163      4.182
6 15-30        4779.   4.180   6.050    77.     1.090     5209.   4.556    83.     0.455    2370.400   2.073     38.192
7 50-20        5967.   3.090   3.090    86.     1.308     7809.   4.044   112.     0.029     226.468   0.117      3.263
SUM------------(CYCLE COMPOSITE)-----------  ----------------------------------------   5836.235   4.598     97.646
AVERAGE SUM OF CYCLES 6-7 --------------  ----------------------------------------   5519.803   4.694     97.683
```

```
SUZUKI T250        RUN-5                                    S - COLD CYCLE
-------------------------------------------------------------------------------------
CYCLE        CONCENTRATION AS DETERMINED        WEIGHTING        W  E  I  G  H  T  E  D
NUMBER          HC           CO        NO(K)     FACTOR          HC          CO        NO(K)
-------------------------------------------------------------------------------------
  1          7828.263      4.110      73.048     0.0875        684.973     0.359       6.391
  2          7141.296      4.253      77.751     0.0875        624.863     0.372       6.803
  3          6214.540      4.409      89.287     0.0875        543.772     0.385       7.812
  4          5800.906      4.385      93.843     0.0875        507.579     0.383       8.211
  6          5203.371      4.789      97.719     0.3250       1691.095     1.556      31.758
  7          5836.235      4.598      97.646     0.3250       1896.776     1.494      31.735
SUM-----------(TRIP COMPOSITE)----------------------------    5949.060     4.552      92.712
```

```
DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
```

```
SUZJKI T250         RUN-6                                      S - COLD CYCLE          K = 1.0000   W =   489.
---------------------------------------------------------------------------------------------------------------
                 CONCENTRATION  AS  MEASURED  DILUTION       A D J U S T E D   WEIGHTING         W E I G H T E D
MODE              HC      CO    CO2   NO(K)    FACTOR      HC      CO    NO(K)   FACTOR        HC       CO       NO(K)
---------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE          6845.  1.990   5.750    51.     1.025     7020.  2.041    52.     0.042      294.859  0.085     2.196
2 0-25          6740.  9.930   6.690    58.     0.765     5161.  7.604    44.     0.244     1259.420  1.855    10.837
3 30            5557.  6.020   5.240    77.     1.017     5653.  6.124    78.     0.118      667.156  0.722     9.244
4 30-15         5248.  5.310   6.050    77.     1.008     5294.  5.356    77.     0.062      328.254  0.332     4.816
5 15            5908.  1.910   7.560    51.     0.973     5751.  1.859    49.     0.050      287.553  0.092     2.462
6 15-30         5331.  3.160   7.960    64.     0.947     5053.  2.995    60.     0.455     2299.154  1.362    27.601
7 50-20         5874.  4.640   4.240    85.     1.123     6600.  5.213    95.     0.029      191.416  0.151     2.769
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------------- 5327.816  4.603    59.949
**CYCLE 2**
1 IDLE          6956.  3.380   4.840    77.     1.032     7182.  3.490    79.     0.042      301.670  0.146     3.339
2 0-25          6864.  3.500   5.810    77.     0.960     6647.  3.389    74.     0.244     1621.895  0.827    18.194
3 30            5523.  5.400   6.910    90.     0.930     5141.  5.027    83.     0.118      606.738  0.593     9.887
4 30-15         5140.  5.450   6.820    84.     0.960     4937.  5.234    80.     0.062      306.094  0.324     5.002
5 15            5715.  3.070   7.190    64.     0.973     5562.  2.988    62.     0.050      278.131  0.149     3.114
6 15-30         5318.  4.360   7.440    67.     0.943     5019.  4.114    63.     0.455     2283.701  1.872    28.771
7 50-20         5700.  4.600   4.520    92.     1.117     6369.  5.140   102.     0.029      184.714  0.149     2.981
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------------- 5582.944  4.062    71.290
**CYCLE 3**
1 IDLE          6735.  3.330   5.270    77.     1.020     6873.  3.398    78.     0.042      288.667  0.142     3.300
2 0-25          6681.  3.830   6.040    81.     0.955     6385.  3.660    77.     0.244     1558.116  0.893    18.890
3 30            5623.  5.500   7.000    90.     0.916     5152.  5.040    82.     0.118      608.042  0.594     9.732
4 30-15         5126.  5.090   7.600    99.     0.924     4739.  4.706    91.     0.062      293.874  0.291     5.675
5 15            5627.  3.520   7.180    64.     0.965     5433.  3.399    61.     0.050      271.660  0.169     3.089
6 15-30         5152.  4.400   7.630    72.     0.941     4852.  4.144    67.     0.455     2208.000  1.885    30.557
7 50-20         6391.  4.910   3.680    79.     1.112     7108.  5.460    87.     0.029      206.133  0.158     2.548
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------------- 5434.495  4.136    74.093
**CYCLE 4**
1 IDLF          6790.  3.660   5.390    77.     0.996     6765.  3.646    76.     0.042      284.137  0.153     3.222
2 0-25          6745.  4.210   6.100    77.     0.936     6314.  3.941    72.     0.244     1540.634  0.961    17.587
3 30            5609.  5.270   7.000    90.     0.923     5182.  4.869    83.     0.118      611.557  0.574     9.812
4 30-15         5239.  5.470   7.530    77.     0.910     4770.  4.981    70.     0.062      295.787  0.308     4.347
5 15            5837.  3.820   7.490    77.     0.923     5389.  3.527    71.     0.050      269.475  0.176     3.554
6 15-30         5438.  4.960   7.500    77.     0.914     4973.  4.536    70.     0.455     2263.111  2.064    32.044
7 50-20         6507.  4.600   3.750    87.     1.108     7214.  5.100    96.     0.029      209.228  0.147     2.797
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------------- 5473.931  4.386    73.367
AVERAGE SUM OF CYCLES 1-4 ------------------------------------------------------------- 5454.797  4.297    69.675
```

```
SUZUKI T250         RUN-6                                      S - COLD CYCLE          K = 1.0000   W =   489.
---------------------------------------------------------------------------------------------------------------
                 CONCENTRATION  AS  MEASURED  DILUTION       A D J U S T E D   WEIGHTING         W E I G H T E D
MODE              HC      CO    CO2   NO(K)    FACTOR      HC      CO    NO(K)   FACTOR        HC       CO       NO(K)
---------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE          3534.  3.290   5.750    77.     1.293     4570.  4.254    99.     0.042      191.960  0.178     4.182
2 0-25          4031.  4.350   5.880    77.     1.168     4710.  5.083    89.     0.244     1149.349  1.240    21.954
3 30            3950.  5.430   7.180    90.     1.023     4044.  5.559    92.     0.118      477.257  0.656    10.874
4 30-15         3748.  4.970   7.930   103.     1.002     3757.  4.982   103.     0.062      232.973  0.308     6.402
5 15            4688.  3.840   7.330    77.     1.013     4749.  3.890    78.     0.050      237.461  0.194     3.900
6 15-30         4489.  5.220   7.330    77.     0.980     4401.  5.118    75.     0.455     2002.700  2.328    34.352
7 50-20         6043.  5.360   3.600    94.     1.132     6842.  6.068   106.     0.029      198.422  0.175     3.086
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------------- 4490.125  5.083    84.753
**CYCLE 7**
1 IDLE          6571.  3.890   5.160    90.     1.021     6709.  3.971    91.     0.042      281.779  0.166     3.859
2 0-25          6539.  4.910   5.970    90.     0.936     6122.  4.597    84.     0.244     1493.820  1.121    20.560
3 30            5557.  4.770   8.140   103.     0.877     4875.  4.185    90.     0.118      575.317  0.493    10.663
4 30-15         5153.  4.460   6.980    94.     0.981     5057.  4.376    92.     0.062      313.534  0.271     5.719
5 15            5714.  3.700   7.560    77.     0.930     5317.  3.443    71.     0.050      265.876  0.172     3.582
6 15-30         5465.  6.480   7.130    82.     0.891     4869.  5.774    73.     0.455     2215.762  2.627    33.246
7 50-20         6144.  4.350   4.410   106.     1.096     6738.  4.770   116.     0.029      195.419  0.138     3.371
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------------- 5341.511  4.991    81.003
AVERAGE SUM OF CYCLES 6-7 ------------------------------------------------------------- 4915.818  5.037    82.878
```

```
SUZUKI T250         RUN-6                                      S - COLD CYCLE
------------------------------------------------------------------------------------------
CYCLE        CONCENTRATION AS DETERMINED       WEIGHTING          W   E   I   G   H   T   E   D
NUMBER         HC          CO        NO(K)       FACTOR          HC           CO          NO(K)
------------------------------------------------------------------------------------------
  1         5327.816     4.603      59.949       0.0875        466.183      0.402        5.245
  2         5582.944     4.062      71.290       0.0875        488.507      0.355        6.237
  3         5434.495     4.136      74.093       0.0875        475.518      0.361        6.483
  4         5473.931     4.386      73.367       0.0875        478.969      0.383        6.419
  6         4490.125     5.083      84.753       0.3250       1459.290      1.652       27.544
  7         5341.511     4.991      81.003       0.3250       1735.991      1.622       26.326
SUM-----------(TRIP COMPOSITE)-------------------------------- 5104.460      4.778       78.257
```

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)

```
TRIUMPH            RUN   1                          B - COLD CYCLE         K = 1.0000   W =   567.
-----------------------------------------------------------------------------------------------------
              CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D    WEIGHTING        W E I G H T E D
MODE           HC      CO     CO2    NO(K)    FACTOR     HC       CO    NO(K)    FACTOR         HC       CO       NO(K)
-----------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE        1063.  7.480  6.950   153.     1.224     1302.   9.161   187.     0.042        54.685   0.384     7.870
2 0-25         720.  5.220  9.520   532.     1.123      808.   5.863   597.     0.244       197.353   1.430   145.822
3 30           416.  7.760  9.300   227.     1.063      442.   8.255   241.     0.118        52.224   0.974    28.497
4 30-15       4761.  5.700  6.090   203.     1.029     4902.   5.869   209.     0.062       303.946   0.363    12.959
5 15           730.  8.620  8.080   198.     1.100      803.   9.484   217.     0.050        40.160   0.474    10.892
6 15-30        672.  6.310  9.890   610.     1.052      707.   6.644   642.     0.455       321.951   3.023   292.247
7 50-20       7521.  3.520  4.740   485.     0.991     7457.   3.490   480.     0.029       216.279   0.101    13.946
SUM----------(CYCLE COMPOSITE)------------------------------------------------------ 1186.600   6.752   512.237
**CYCLE 2**
1 IDLE        3283.  8.830  4.880   215.     1.129     3707.   9.971   242.     0.042       155.704   0.418    10.196
2 0-25        1436.  7.740  8.610   598.     1.033     1484.   7.998   617.     0.244       362.099   1.951   150.790
3 30          1009.  8.910  8.530   239.     1.030     1039.   9.179   246.     0.118       122.659   1.083    29.054
4 30-15       5904.  6.520  5.300   231.     0.970     5731.   6.329   224.     0.062       355.355   0.392    13.903
5 15          1105.  9.540  7.580   210.     1.070     1183.  10.213   224.     0.050        59.152   0.510    11.241
6 15-30        937.  6.790  9.580   724.     1.036      971.   7.039   750.     0.455       441.972   3.202   341.503
7 50-20       7634.  4.020  4.640   448.     0.973     7431.   3.913   436.     0.029       215.519   0.113    12.647
SUM----------(CYCLE COMPOSITE)------------------------------------------------------ 1712.462   7.673   569.337
**CYCLE 3**
1 IDLE        3852.  9.090 ' 4.880   239.     1.067     4111.   9.702   255.     0.042       172.678   0.407    10.713
2 0-25        1752.  7.620  9.030   551.     0.984     1724.   7.499   542.     0.244       420.751   1.829   132.325
3 30           937.  9.660  8.110   264.     1.039      973.  10.039   274.     0.118       114.909   1.184    32.375
4 30-15       5361.  6.920  4.990   242.     1.018     5458.   7.046   246.     0.062       338.453   0.436    15.278
5 15          1317.  9.540  7.390   215.     1.067     1405.  10.184   229.     0.050        70.298   0.509    11.476
6 15-30       1024.  8.170  8.810   433.     1.035     1060.   8.461   448.     0.455       482.528   3.849   204.037
7 50-20       7042.  5.630  3.710   283.     1.026     7226.   5.777   290.     0.029       209.560   0.167     8.421
SUM----------(CYCLE COMPOSITE)------------------------------------------------------ 1809.180   8.385   414.628
**CYCLE 4**
1 IDLE        2335.  9.270  6.470   239.     1.064     2484.   9.864   254.     0.042       104.354   0.414    10.681
2 0-25        1537.  8.330  7.480   440.     1.089     1675.   9.078   479.     0.244       408.712   2.215   117.002
3 30          1063.  9.700  7.750   239.     1.054     1121.  10.230   252.     0.118       132.294   1.207    29.744
4 30-15       4777.  7.690  5.500   239.     0.999     4775.   7.687   238.     0.062       296.089   0.476    14.813
5 15          1601.  9.900  7.230   226.     1.042     1669.  10.320   235.     0.050        83.450   0.516    11.780
6 15-30       1147.  8.940  8.280   399.     1.036     1188.   9.266   413.     0.455       540.958   4.216   188.179
7 50-20       8199.  5.190  3.540   290.     0.967     7931.   5.020   280.     0.029       229.999   0.145     8.135
SUM----------(CYCLE COMPOSITE)------------------------------------------------------ 1795.859   9.191   380.337
AVERAGE SUM OF CYCLES 1-4 ---------------------------------------------------------- 1626.025   8.000   469.135
```

```
TRIUMPH            RUN   1                          B - COLD CYCLE         K = 1.0000   W =   567.
-----------------------------------------------------------------------------------------------------
              CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D    WEIGHTING        W E I G H T E D
MODE           HC      CO     CO2    NO(K)    FACTOR     HC       CO    NO(K)    FACTOR         HC       CO       NO(K)
-----------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE        2333.  9.780  5.890   165.     1.090     2543.  10.662   179.     0.042       106.829   0.447     7.555
2 0-25        1130.  8.430  8.500   425.     1.040     1175.   8.771   442.     0.244       286.890   2.140   107.901
3 30           647.  9.900  8.080   202.     1.056      683.  10.456   213.     0.118        80.634   1.233    25.175
4 30-15       4875.  6.890  4.960   192.     1.060     5170.   7.308   203.     0.062       320.601   0.453    12.626
5 15          1316. 10.530  6.950   177.     1.063     1399.  11.196   188.     0.050        69.967   0.559     9.410
6 15-30        892.  9.330  8.200   386.     1.048      935.   9.783   404.     0.455       425.572   4.451   184.160
7 50-20       8248.  5.040  3.260   238.     0.987     8142.   4.975   234.     0.029       236.133   0.144     6.813
SUM----------(CYCLE COMPOSITE)------------------------------------------------------ 1526.630   9.430   353.643
**CYCLE 7**
1 IDLE        2458.  9.660  6.200   302.     1.059     2604.  10.235   319.     0.042       109.387   0.429    13.439
2 0-25        1607.  9.070  7.660   361.     1.040     1672.   9.440   375.     0.244       408.136   2.303    91.684
3 30           895. 10.200  7.290   214.     1.085      971.  11.073   232.     0.118       114.650   1.306    27.413
4 30-15       5267.  7.020  5.280   206.     1.001     5274.   7.030   206.     0.062       327.042   0.435    12.791
5 15          1746. 10.710  6.740   202.     1.037     1810.  11.107   209.     0.050        90.542   0.555    10.475
6 15-30       1157.  9.850  7.880   318.     1.031     1193.  10.162   328.     0.455       543.119   4.623   149.275
7 50-20       7547.  5.610  3.550   257.     0.999     7544.   5.607   256.     0.029       218.776   0.162     7.450
SUM----------(CYCLE COMPOSITE)------------------------------------------------------ 1811.654   9.817   312.530
AVERAGE SUM OF CYCLES 6-7 ---------------------------------------------------------- 1669.142   9.624   333.086
```

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TRIUMPH            RUN   1                          B - COLD CYCLE
--------------------------------------------------------------------------------
CYCLE       CONCENTRATION AS DETERMINED       WEIGHTING          W  E  I  G  H  T  E  D
NUMBER        HC          CO        NO(K)        FACTOR           HC        CO         NO(K)
--------------------------------------------------------------------------------
  1        1186.600     6.752     512.237       0.0875         103.827    0.590       44.820
  2        1712.462     7.673     569.337       0.0875         149.840    0.671       49.817
  3        1809.180     8.385     414.628       0.0875         158.303    0.733       36.280
  4        1795.859     9.191     380.337       0.0875         157.137    0.804       33.279
  6        1526.630     9.430     353.643       0.3250         496.154    3.064      114.934
  7        1811.654     9.817     312.530       0.3250         588.787    3.190      101.572
SUM------------(TRIP COMPOSITE)------------------------------ 1654.051    9.055      380.703
```

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)

```
TRIUMPH             RUN   2                                B - COLD CYCLE          K = 1.0000    W =    567.
----------------------------------------------------------------------------------------------------------------
MODE           CONCENTRATION  AS  MEASURED  DILUTION    A D J U S T E D   WEIGHTING        W E I G H T E D
                 HC      CO    CO2    NO(K)    FACTOR    HC      CO   NO(K)   FACTOR        HC      CO       NO(K)
----------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE          895.  5.700  4.880     69.     1.667    1492.  9.503   115.    0.042       62.674  0.399     4.831
2 0-25         1109.  6.080  5.130    267.     1.547    1716.  9.411   413.    0.244      418.847  2.296   100.840
3 30            375.  4.730  5.770    141.     1.697     636.  8.031   239.    0.118       75.131  0.947    28.249
4 30-15        3257.  4.370  4.730    124.     1.389    4526.  6.073   172.    0.062      280.663  0.376    10.685
5 15           1147.  6.410  5.490     93.     1.459    1674.  9.356   135.    0.050       83.712  0.467     6.787
6 15-30         848.  5.400  5.700    429.     1.556    1319.  8.405   667.    0.455      600.555  3.824   303.818
7 50-20        7469.  2.270  3.450    364.     1.146    8560.  2.601   417.    0.029      248.247  0.075    12.098
SUM-----------(CYCLE COMPOSITE)--------------------------------------------------------- 1769.832  8.387   467.311
**CYCLE 2**
1 IDLE         4905.  6.260  3.360    141.     1.230    6033.  7.700   173.    0.042      253.418  0.323     7.284
2 0-25         2203.  5.710  5.130    451.     1.399    3082.  7.988   630.    0.244      752.029  1.949   153.956
3 30            979.  5.370  5.220    165.     1.617    1583.  8.688   266.    0.118      186.901  1.025    31.500
4 30-15        4899.  4.870  4.340    145.     1.201    5887.  5.852   174.    0.062      365.011  0.362    10.803
5 15           1659.  6.420  3.510    121.     1.703    2826. 10.936   206.    0.050      141.308  0.546    10.306
6 15-30        1128.  5.540  5.820    357.     1.478    1667.  8.190   527.    0.455      758.747  3.726   240.135
7 50-20        7425.  2.770  3.480    310.     1.125    8356.  3.117   348.    0.029      242.332  0.090    10.117
SUM-----------(CYCLE COMPOSITE)--------------------------------------------------------- 2699.749  8.024   464.104
**CYCLE 3**
1 IDLE         5580.  6.010 · 3.070    153.     1.198    6686.  7.201   183.    0.042      280.812  0.302     7.699
2 0-25         3023.  5.910  4.690    371.     1.329    4017.  7.854   493.    0.244      980.341  1.916   120.313
3 30           1105.  6.710  5.340    157.     1.466    1620.  9.839   230.    0.118      191.199  1.161    27.165
4 30-15        4727.  4.800  3.840    157.     1.278    6041.  6.134   200.    0.062      374.571  0.380    12.440
5 15           2300.  6.870  4.880    141.     1.342    3088.  9.224   189.    0.050      154.412  0.461     9.466
6 15-30        1407.  5.960  5.760    316.     1.413    1988.  8.423   446.    0.455      904.783  3.832   203.206
7 50-20        7176.  3.380  2.730    193.     1.191    8549.  4.027   229.    0.029      247.944  0.116     6.668
SUM-----------(CYCLE COMPOSITE)--------------------------------------------------------- 3134.065  8.171   386.960
**CYCLE 4**
1 IDLE         5298.  6.280  3.120    177.     1.210    6411.  7.599   214.    0.042      269.281  0.319     8.996
2 0-25         2744.  5.950  4.790    460.     1.351    3708.  8.041   621.    0.244      904.903  1.962   151.696
3 30           1231.  6.630  5.310    165.     1.456    1793.  9.657   240.    0.118      211.587  1.139    28.360
4 30-15        4719.  5.290  4.050    169.     1.229    5802.  6.505   207.    0.062      359.782  0.403    12.884
5 15           2541.  6.930  4.640    165.     1.336    3396.  9.261   220.    0.050      169.801  0.463    11.026
6 15-30        1941.  6.340  5.450    335.     1.353    2626.  8.578   453.    0.455     1194.980  3.903   206.243
7 50-20        7179.  2.660  3.400    371.     1.161    8338.  3.089   430.    0.029      241.824  0.089    12.497
SUM-----------(CYCLE COMPOSITE)--------------------------------------------------------- 3352.160  8.280   431.704
AVERAGE SUM OF CYCLES 1-4 -------------------------------------------------------------- 2738.952  8.215   437.520
```

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TRIUMPH             RUN   2                                B - COLD CYCLE          K = 1.0000    W =    567.
----------------------------------------------------------------------------------------------------------------
MODE           CONCENTRATION  AS  MEASURED  DILUTION    A D J U S T E D   WEIGHTING        W E I G H T E D
                 HC      CO    CO2    NO(K)    FACTOR    HC      CO   NO(K)   FACTOR        HC      CO       NO(K)
----------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE         5004.  6.160  3.280     93.     1.232    6167.  7.592   114.    0.042      259.040  0.318     4.814
2 0-25         2434.  6.370  5.270    308.     1.308    3184.  8.333   402.    0.244      776.949  2.033    98.315
3 30           1021.  6.540  4.640     93.     1.608    1642. 10.521   149.    0.118      193.830  1.241    17.655
4 30-15        3458.  4.740  3.400     81.     1.525    5275.  7.231   123.    0.062      327.076  0.448     7.661
5 15           2481.  7.300  4.820    141.     1.300    3226.  9.493   183.    0.050      161.328  0.474     9.168
6 15-30        1535.  6.010  5.720    377.     1.396    2143.  8.393   526.    0.455      975.378  3.818   239.555
7 50-20        6941.  3.590  2.230    134.     1.258    8735.  4.518   168.    0.029      253.330  0.131     4.890
SUM-----------(CYCLE COMPOSITE)--------------------------------------------------------- 2946.934  8.466   382.061
**CYCLE 7**
1 IDLE         4854.  6.620  3.580    141.     1.195    5801.  7.911   168.    0.042      243.653  0.332     7.077
2 0-25         3000.  6.250  5.100    323.     1.264    3794.  7.904   408.    0.244      925.774  1.928    99.675
3 30           1359.  7.210  5.020    141.     1.436    1952. 10.358   202.    0.118      230.388  1.222    23.903
4 30-15        4389.  5.080  3.030    133.     1.406    6172.  7.144   187.    0.062      382.702  0.442    11.597
5 15           3043.  7.570  4.480    129.     1.255    3819.  9.502   161.    0.050      190.987  0.475     8.096
6 15-30        2063.  6.520  5.400    267.     1.331    2747.  8.682   355.    0.455     1250.054  3.950   161.786
7 50-20        6390.  2.790  2.970    340.     1.287    8224.  3.590   437.    0.029      238.500  0.104    12.690
SUM-----------(CYCLE COMPOSITE)--------------------------------------------------------- 3462.061  8.456   324.825
AVERAGE SUM OF CYCLES 6-7 -------------------------------------------------------------- 3204.497  8.461   353.443
```

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TRIUMPH             RUN   2                                B - COLD CYCLE
------------------------------------------------------------------------------------
CYCLE        CONCENTRATION AS DETERMINED      WEIGHTING        W   E   I   G   H   T   E   D
NUMBER          HC         CO        NO(K)      FACTOR          HC          CO          NO(K)
------------------------------------------------------------------------------------
  1          1769.832    8.387     467.311     0.0875         154.860     0.733      40.889
  2          2699.749    8.024     464.104     0.0875         236.228     0.702      40.609
  3          3134.065    8.171     386.960     0.0875         274.230     0.714      33.859
  4          3352.160    8.280     431.704     0.0875         293.314     0.724      37.774
  6          2946.934    8.466     382.061     0.3250         957.753     2.751     124.170
  7          3462.061    8.456     324.825     0.3250        1125.169     2.748     105.568
SUM-----------(TRIP COMPOSITE)------------------------------ 3041.556     8.375     382.870
```

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)

```
TRIUMPH              RUN   3                                   B - COLD CYCLE              K = 1.0000    W =    567.
--------------------------------------------------------------------------------------------------------------------
            CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D     WEIGHTING        W E I G H T E D
MODE          HC      CO     CO2    NO(K)    FACTOR     HC      CO   NO(K)     FACTOR         HC       CO       NO(K)
--------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE        2317.   7.790   6.920    69.    1.088    2522.   8.481    75.     0.042        105.955   0.356      3.155
2 0-25        1032.   7.990   8.200   378.    1.089    1124.   8.704   411.     0.244        274.330   2.123    100.481
3 30           374.   6.760   9.410   165.    1.098     411.   7.429   181.     0.118         48.500   0.876     21.397
4 30-15       3536.   7.760   7.790   132.    0.936    3310.   7.264   123.     0.062        205.235   0.450      7.661
5 15          1487.   8.760   6.830    85.    1.131    1682.   9.911    96.     0.050         84.119   0.495      4.808
6 15-30        999.   8.510   8.450   410.    1.051    1050.   8.952   431.     0.455        478.158   4.073    196.241
7 50-20       8600.   4.920   4.760   184.    0.878    7553.   4.321   161.     0.029        219.063   0.125      4.686
SUM-------------(CYCLE COMPOSITE)--------------------------------------------------------- 1415.364   8.501    338.432
**CYCLE 2**
1 IDLE        2066.   9.540   6.150   113.    1.102    2277.  10.518   124.     0.042         95.670   0.441      5.232
2 0-25        1406.   9.200   7.260   166.    1.083    1523.   9.971   179.     0.244        371.823   2.432     43.899
3 30           895.   8.870   8.390   129.    1.051     940.   9.325   135.     0.118        111.034   1.100     16.003
4 30-15       5741.   8.560   7.230   113.    0.818    4700.   7.008    92.     0.062        291.421   0.434      5.736
5 15          1503.  10.020   7.170   113.    1.050    1578.  10.525   118.     0.050         78.943   0.526      5.935
6 15-30       1086.   9.000   8.190   230.    1.045    1135.   9.413   240.     0.455        516.839   4.283    109.459
7 50-20       7606.   5.740   5.250   179.    0.887    6751.   5.095   158.     0.029        195.801   0.147      4.608
SUM-------------(CYCLE COMPOSITE)--------------------------------------------------------- 1661.535   9.366    190.874
**CYCLE 3**
1 IDLE        3937.   9.430 · 5.860   141.    0.977    3850.   9.222   137.     0.042        161.707   0.387      5.791
2 0-25        2195.   9.090   6.600   444.    1.072    2354.   9.752   476.     0.244        574.588   2.379    116.226
3 30          1147.   9.620   8.190   141.    1.018    1168.   9.796   143.     0.118        137.829   1.155     16.943
4 30-15       5351.   9.530   7.430   124.    0.806    4316.   7.688   100.     0.062        267.638   0.476      6.202
5 15          2362.  10.320   6.410   117.    1.026    2425.  10.597   120.     0.050        121.270   0.529      6.007
6 15-30       1573.   9.310   7.440   211.    1.051    1653.   9.786   221.     0.455        752.355   4.452    100.919
7 50-20       7881.   6.140   5.220   180.    0.863    6801.   5.298   155.     0.029        197.242   0.153      4.504
SUM-------------(CYCLE COMPOSITE)--------------------------------------------------------- 2212.631   9.535    256.595
**CYCLE 4**
1 IDLE        3607.   9.660   5.950   141.    0.988    3563.   9.544   139.     0.042        149.681   0.400      5.851
2 0-25        2146.  12.190   7.700   257.    0.899    1931.  10.969   231.     0.244        471.215   2.676     56.431
3 30          1189.   9.900   8.180   141.    1.005    1196.   9.958   141.     0.118        141.137   1.175     16.737
4 30-15       5150.   9.290   6.580   132.    0.863    4448.   8.024   114.     0.062        275.799   0.497      7.069
5 15          2707.  10.340   7.010   117.    0.960    2598.   9.926   112.     0.050        129.941   0.496      5.616
6 15-30       1711.   9.580   8.490   203.    0.958    1639.   9.182   194.     0.455        746.193   4.177     88.531
7 50-20       8759.   8.260   4.980   187.    0.780    6839.   6.449   146.     0.029        198.342   0.187      4.234
SUM-------------(CYCLE COMPOSITE)--------------------------------------------------------- 2112.311   9.611    184.471
AVERAGE SUM OF CYCLES 1-4 ---------------------------------------------------------------- 1850.460   9.253    242.593
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TRIUMPH              RUN   3                                   B - COLD CYCLE              K = 1.0000    W =    567.
--------------------------------------------------------------------------------------------------------------------
            CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D     WEIGHTING        W E I G H T E D
MODE          HC      CO     CO2    NO(K)    FACTOR     HC      CO   NO(K)     FACTOR         HC       CO       NO(K)
--------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE        3089.   9.540   5.580    93.    1.059    3272.  10.107    98.     0.042        137.453   0.424      4.138
2 0-25        1754.   9.690   6.680   127.    1.080    1895.  10.470   137.     0.244        462.441   2.554     33.483
3 30           812.  10.230   7.940   133.    1.040     845.  10.647   138.     0.118         99.722   1.256     16.333
4 30-15       4942.   9.090   7.110   124.    0.853    4217.   7.756   105.     0.062        261.462   0.480      6.560
5 15          3091.  10.400   6.950   105.    0.936    2893.   9.736    98.     0.050        144.688   0.486      4.915
6 15-30       1528.   9.870   7.600   157.    1.022    1561.  10.089   160.     0.455        710.666   4.590     73.020
7 50-20       8243.   7.970   4.480   219.    0.834    6882.   6.654   182.     0.029        199.579   0.192      5.302
SUM-------------(CYCLE COMPOSITE)--------------------------------------------------------- 2016.014   9.986    143.753
**CYCLE 7**
1 IDLE        3228.   9.780   6.200   129.    0.994    3211.   9.728   128.     0.042        134.866   0.408      5.389
2 0-25        2104.   9.950   6.280   154.    1.071    2255.  10.665   165.     0.244        550.290   2.602     40.277
3 30          1189.   9.480   7.840   161.    1.045    1243.   9.914   168.     0.118        146.736   1.169     19.869
4 30-15       3965.  10.240   7.580   118.    0.853    3385.   8.743   100.     0.062        209.898   0.542      6.246
5 15          3135.   9.560   5.820   117.    1.036    3250.   9.911   121.     0.050        162.513   0.495      6.065
6 15-30       1971.  10.540   6.980   126.    1.008    1987.  10.628   127.     0.455        904.371   4.836     57.813
7 50-20       8215.   7.860   4.890   213.    0.819    6732.   6.441   174.     0.029        195.250   0.186      5.062
SUM-------------(CYCLE COMPOSITE)--------------------------------------------------------- 2303.927  10.241    140.724
AVERAGE SUM OF CYCLES 6-7 ---------------------------------------------------------------- 2159.970  10.114    142.239

TRIUMPH              RUN   3                                   B - COLD CYCLE
------------------------------------------------------------------------------------------------
CYCLE       CONCENTRATION AS DETERMINED           WEIGHTING          W   E   I   G   H   T   E   D
NUMBER          HC          CO       NO(K)           FACTOR             HC           CO         NO(K)
------------------------------------------------------------------------------------------------
  1        1415.364      8.501     338.432          0.0875            123.844       0.743       29.612
  2        1661.535      9.366     190.874          0.0875            145.384       0.819       16.701
  3        2212.631      9.535     256.595          0.0875            193.605       0.834       22.452
  4        2112.311      9.611     184.471          0.0875            184.827       0.841       16.141
  6        2016.014      9.986     143.753          0.3250            655.204       3.245       46.719
  7        2303.927     10.241     140.724          0.3250            748.776       3.328       45.735
SUM-------------(TRIP COMPOSITE)----------------------------------- 2051.642       9.813      177.363
```

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)

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TRIUMPH T120R       RUN-4                                          S - COLD CYCLE            K = 1.0000    W =    567.
-----------------------------------------------------------------------------------------------------------------------
                   CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D   WEIGHTING         W E I G H T E D
MODE                 HC      CO    CO2    NO(K)    FACTOR     HC        CO   NO(K)    FACTOR         HC       CO         NO(K)
-----------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE             966.   9.780   7.000     68.     1.121    1083.  10.964     76.     0.042         45.486   0.460       3.201
2 0-25            1078.   8.650   8.050    141.     1.070    1154.   9.263    151.     0.244        281.697   2.260      36.845
3 30               391.   7.620   9.370    157.     1.065     416.   8.122    167.     0.118         49.183   0.958      19.748
4 30-15            416.   6.600   7.820    116.     1.253     521.   8.271    145.     0.062         32.325   0.512       9.013
5 15              3666.   9.540   7.940     77.     0.869    3188.   8.298     66.     0.050        159.445   0.414       3.348
6 15-30            304.   7.900   8.780    222.     1.110     337.   8.772    246.     0.455        153.590   3.991     112.161
7 50-20           4502.   5.370   4.840    144.     1.170    5269.   6.285    168.     0.029        152.826   0.182       4.889
SUM------------(CYCLE COMPOSITE)------------------------------------------------------------  874.556   8.780     189.208
**CYCLE 2**
1 IDLE            6015.   8.950   4.640    103.     0.928    5586.   8.312     95.     0.042        234.647   0.349       4.018
2 0-25            4943.   8.640   6.550    192.     0.894    4421.   7.729    171.     0.244       1078.964   1.885      41.910
3 30               281.   8.810   8.850    138.     1.069     300.   9.421    147.     0.118         35.460   1.111      17.414
4 30-15           1169.   7.850   7.710    121.     1.124    1314.   8.825    136.     0.062         81.483   0.547       8.434
5 15              4443.   9.910   7.690     77.     0.831    3693.   8.237     64.     0.050        184.663   0.411       3.200
6 15-30           2200.   8.960   8.310    217.     0.956    2103.   8.566    207.     0.455        957.042   3.897      94.399
7 50-20           4847.   6.160   4.710    113.     1.113    5395.   6.857    125.     0.029        156.483   0.198       3.648
SUM------------(CYCLE COMPOSITE)------------------------------------------------------------ 2728.746   8.402     173.024
**CYCLE 3**
1 IDLE            6068.   8.950   4.770    103.     0.917    5569.   8.214     94.     0.042        233.909   0.345       3.970
2 0-25            5079.   8.160   7.160    303.     0.866    4403.   7.074    262.     0.244       1074.389   1.726      64.095
3 30              1488.   9.950   8.340    143.     0.971    1445.   9.668    138.     0.118        170.617   1.140      16.396
4 30-15           1346.   8.560   7.430    114.     1.101    1482.   9.428    125.     0.062         91.923   0.584       7.785
5 15              5081.  10.220   7.250     86.     0.812    4128.   8.303     69.     0.050        206.400   0.415       3.493
6 15-30           2902.   9.410   8.700    222.     0.876    2544.   8.249    194.     0.455       1157.612   3.753      88.556
7 50-20           4842.   4.170   5.960    350.     1.092    5289.   4.555    382.     0.029        153.382   0.132      11.087
SUM------------(CYCLE COMPOSITE)------------------------------------------------------------ 3088.236   8.097     195.384
**CYCLE 4**
1 IDLE            7291.   9.280   4.110    129.     0.872    6359.   8.094    112.     0.042        267.092   0.339       4.725
2 0-25            6047.   8.290   6.850    225.     0.827    5003.   6.858    186.     0.244       1220.733   1.673      45.421
3 30              2083.  10.290   8.230    134.     0.928    1933.   9.549    124.     0.118        228.102   1.126      14.673
4 30-15           1787.   8.830   6.970    114.     1.089    1946.   9.615    124.     0.062        120.654   0.596       7.697
5 15              4881.  10.450   6.820     81.     0.837    4087.   8.750     67.     0.050        204.355   0.437       3.391
6 15-30           2852.   8.810   8.360    222.     0.915    2609.   8.062    203.     0.455       1187.496   3.668      92.434
7 50-20           4421.   4.010   5.660    469.     1.165    5153.   4.674    546.     0.029        149.443   0.135      15.853
SUM------------(CYCLE COMPOSITE)------------------------------------------------------------ 3377.878   7.977     184.198
AVERAGE SUM OF CYCLES 1-4 ------------------------------------------------------------------ 2517.354   8.314     185.454
```

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TRIUMPH T120R       RUN-4                                          S - COLD CYCLE            K = 1.0000    W =    567.
-----------------------------------------------------------------------------------------------------------------------
                   CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D   WEIGHTING         W E I G H T E D
MODE                 HC      CO    CO2    NO(K)    FACTOR     HC        CO   NO(K)    FACTOR         HC       CO         NO(K)
-----------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE            5229.   8.780   3.250    129.     1.091    5706.   9.581    140.     0.042        239.661   0.402       5.912
2 0-25            4328.   9.410   6.060    187.     0.939    4064.   8.837    175.     0.244        991.788   2.156      42.852
3 30              1431.   9.390   7.940    134.     1.022    1463.   9.601    137.     0.118        172.662   1.132      16.168
4 30-15           1347.   8.980   6.680    117.     1.148    1547.  10.313    134.     0.062         95.918   0.639       8.331
5 15              4824.  10.630   6.050    103.     0.874    4220.   9.299     90.     0.050        211.005   0.464       4.505
6 15-30           3497.  10.620   6.690    190.     0.919    3213.   9.760    174.     0.455       1462.369   4.441      79.453
7 50-20           4368.   4.400   6.140    367.     1.110    4850.   4.886    407.     0.029        140.666   0.141      11.818
SUM------------(CYCLE COMPOSITE)------------------------------------------------------------ 3314.073   9.378     169.042
**CYCLE 7**
1 IDLE            4607.  10.480   5.500    117.     0.922    4250.   9.669    107.     0.042        178.527   0.406       4.533
2 0-25            3742.   9.910   6.620    218.     0.928    3474.   9.201    202.     0.244        847.777   2.245      49.389
3 30              1681.  10.510   8.310    143.     0.942    1584.   9.908    134.     0.118        187.002   1.169      15.908
4 30-15           1585.   9.240   6.170    143.     1.159    1838.  10.716    165.     0.062        113.976   0.664      10.283
5 15              5336.  11.060   6.320    103.     0.823    4392.   9.105     84.     0.050        219.646   0.455       4.239
6 15-30           3250.  10.410   7.370    206.     0.901    2929.   9.384    185.     0.455       1333.035   4.269      84.493
7 50-20           4460.   6.100   4.720    178.     1.152    5137.   7.027    205.     0.029        148.999   0.203       5.946
SUM------------(CYCLE COMPOSITE)------------------------------------------------------------ 3028.965   9.413     174.794
AVERAGE SUM OF CYCLES 6-7 ------------------------------------------------------------------ 3171.519   9.396     171.918
```

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TRIUMPH T120R       RUN-4                                          S - COLD CYCLE
-------------------------------------------------------------------------------------------
CYCLE        CONCENTRATION AS DETERMINED        WEIGHTING           W   E   I   G   H   T   E   D
NUMBER          HC          CO        NO(K)       FACTOR              HC          CO           NO(K)
-------------------------------------------------------------------------------------------
  1          874.556     8.780     189.208       0.0875             76.523      0.768        16.555
  2         2728.746     8.402     173.024       0.0875            238.765      0.735        15.139
  3         3088.236     8.097     195.384       0.0875            270.220      0.708        17.096
  4         3377.878     7.977     184.198       0.0875            295.564      0.698        16.117
  6         3314.073     9.378     169.042       0.3250           1077.074      3.048        54.938
  7         3028.965     9.413     174.794       0.3250            984.413      3.059        56.808
SUM------------(TRIP COMPOSITE)------------------------------- 2942.561      9.017       176.656
```

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)

```
TRIUMPH T120R       RUN  5                                          S - COLD CYCLE          K = 1.0000   W =    567.
----------------------------------------------------------------------------------------------------------------------
MODE            CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D     WEIGHTING        W E I G H T E D
                 HC      CO    CO2   NO(K)    FACTOR      HC       CO   NO(K)    FACTOR       HC       CO       NO(K)
----------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE         1415.  8.220   7.430     51.    1.109     1570.  9.120     56.     0.042      65.941  0.383      2.376
2 0-25         1271.  7.830   7.880    152.    1.101     1399.  8.622    167.     0.244     341.502  2.103     40.840
3 30            261.  6.860   9.980    143.    1.059      276.  7.264    151.     0.118      32.615  0.857     17.869
4 30-15         362.  6.550   9.170    112.    1.129      408.  7.399    126.     0.062      25.353  0.458      7.844
5 15           2915.  8.420   8.540     77.    0.912     2658.  7.679     70.     0.050     132.931  0.383      3.511
6 15-30         387.  7.770   9.010    184.    1.089      421.  8.462    200.     0.455     191.785  3.850     91.184
7 50-20        4999.  5.100   5.120    155.    1.109     5546.  5.658    171.     0.029     160.845  0.164      4.987
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------------ 950.976  8.201    168.614
**CYCLE 2**
1 IDLE         2789. 10.030   6.670     77.    0.986     2751.  9.895     75.     0.042     115.566  0.415      3.190
2 0-25         2315.  9.210   7.400    168.    0.999     2314.  9.206    167.     0.244     564.657  2.246     40.977
3 30            285.  9.060   8.840    117.    1.060      302.  9.604    124.     0.118      35.651  1.133     14.635
4 30-15         855.  8.370   8.410    105.    1.072      917.  8.977    112.     0.062      56.859  0.556      6.982
5 15           4675.  9.910   7.560     77.    0.825     3859.  8.181     63.     0.050     192.972  0.409      3.178
6 15-30        2427.  8.830   8.570    228.    0.929     2254.  8.204    211.     0.455    1026.013  3.732     96.386
7 50-20        4625.  5.200   5.460    147.    1.110     5136.  5.775    163.     0.029     148.970  0.167      4.734
SUM-----------(CYCLE COMPOSITE)----------------------------------------------------------- 2140.692  8.661    170.086
**CYCLE 3**
1 IDLE         4358. 10.470   6.530     77.    0.880     3836.  9.216     67.     0.042     161.126  0.387      2.846
2 0-25         3249.  9.760   7.240    153.    0.927     3014.  9.055    141.     0.244     735.493  2.209     34.635
3 30           1161.  9.630   8.680    130.    0.983     1141.  9.467    127.     0.118     134.686  1.117     15.081
4 30-15        1032.  5.790   7.870    106.    1.220     1259.  7.067    129.     0.062      78.097  0.438      8.021
5 15           4358. 10.430   7.180     77.    0.847     3695.  8.843     65.     0.050     184.751  0.442      3.264
6 15-30        2759.  9.240   8.190    239.    0.918     2532.  8.485    219.     0.455    1152.468  3.861     99.869
7 50-20        3602.  5.970   5.060    121.    1.214     4376.  7.252    147.     0.029     126.905  0.210      4.263
SUM-----------(CYCLE COMPOSITE)----------------------------------------------------------- 2573.529  8.665    167.981
**CYCLE 4**
1 IDLE         3798. 10.400   6.300     77.    0.929     3529.  9.665     71.     0.042     148.250  0.405      3.005
2 0-25         3112.  9.720   7.380    195.    0.929     2892.  9.034    181.     0.244     705.742  2.204     44.222
3 30            239. 10.050   8.480    129.    1.053      251. 10.588    135.     0.118      29.711  1.249     16.036
4 30-15        1201.  8.750   7.670    113.    1.086     1305.  9.509    122.     0.062      80.924  0.559      7.614
5 15           4542. 10.400   7.000     77.    0.847     3850.  8.815     65.     0.050     192.509  0.440      3.263
6 15-30        2849.  8.480   8.080    235.    0.941     2683.  7.986    221.     0.455    1220.781  3.633    100.696
7 50-20        4255.  4.300   4.210    112.    1.323     5631.  5.691    148.     0.029     163.319  0.165      4.298
SUM-----------(CYCLE COMPOSITE)----------------------------------------------------------- 2541.239  8.688    179.137
AVERAGE SUM OF CYCLES 1-4 ---------------------------------------------------------------- 2051.609  8.554    171.455
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PETRO-CHEM COMPUTING INC

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TRIUMPH T120R       RUN  5                                          S - COLD CYCLE          K = 1.0000   W =    567.
----------------------------------------------------------------------------------------------------------------------
MODE            CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D     WEIGHTING        W E I G H T E D
                 HC      CO    CO2   NO(K)    FACTOR      HC       CO   NO(K)    FACTOR       HC       CO       NO(K)
----------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE         1776. 11.000   5.500     90.    1.122     1993. 12.347    101.     0.042      83.726  0.518      4.242
2 0-25         1869.  9.590   6.350    235.    1.101     2058. 10.563    258.     0.244     502.336  2.577     63.161
3 30           1317. 10.200   8.240    134.    0.982     1293. 10.018    131.     0.118     152.644  1.182     15.530
4 30-15         822.  8.790   6.440    119.    1.236     1016. 10.872    147.     0.062      63.037  0.674      9.125
5 15           2824. 11.100   6.670     90.    0.949     2681. 10.540     85.     0.050     134.080  0.527      4.273
6 15-30        2831. 10.430   6.990    181.    0.950     2689.  9.908    171.     0.455    1223.754  4.508     78.240
7 50-20        3682.  4.850   5.400    262.    1.228     4523.  5.958    321.     0.029     131.192  0.172      9.335
SUM-----------(CYCLE COMPOSITE)----------------------------------------------------------- 2290.772 10.160    183.910
**CYCLE 7**
1 IDLE         4124. 10.450   6.050    103.    0.921     3801.  9.633     94.     0.042     159.675  0.404      3.988
2 0-25         3409.  9.940   7.050    203.    0.923     3148.  9.179    187.     0.244     768.135  2.239     45.741
3 30            265. 11.160   7.850    130.    1.057      280. 11.797    137.     0.118      33.056  1.392     16.216
4 30-15        1388.  9.830   7.090    125.    1.073     1490. 10.554    134.     0.062      92.402  0.654      8.321
5 15           4309. 10.840   6.300    103.    0.885     3815.  9.599     91.     0.050     190.795  0.479      4.560
6 15-30        2965.  9.970   7.660    252.    0.914     2712.  9.122    230.     0.455    1234.387  4.150    104.912
7 50-20        4962.  5.960   4.980    179.    1.088     5401.  6.488    194.     0.029     156.657  0.188      5.651
SUM-----------(CYCLE COMPOSITE)----------------------------------------------------------- 2635.110  9.509    189.391
AVERAGE SUM OF CYCLES 6-7 ---------------------------------------------------------------- 2462.941  9.835    186.651
```

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TRIUMPH T120R       RUN  5                                          S - COLD CYCLE
-----------------------------------------------------------------------------------------
CYCLE          CONCENTRATION AS DETERMINED        WEIGHTING         W   E   I   G   H   T   E   D
NUMBER           HC          CO        NO(K)        FACTOR          HC          CO          NO(K)
-----------------------------------------------------------------------------------------

  1            950.976     8.201     168.614       0.0875         83.210      0.717       14.753
  2           2140.692     8.661     170.086       0.0875        187.310      0.757       14.882
  3           2573.529     8.665     167.981       0.0875        225.183      0.758       14.698
  4           2541.239     8.688     179.137       0.0875        222.358      0.760       15.674
  6           2290.772    10.160     183.910       0.3250        744.501      3.302       59.770
  7           2635.110     9.509     189.391       0.3250        856.410      3.090       61.552
SUM-----------(TRIP COMPOSITE)---------------------------- 2318.975      9.386      181.332
```

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DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
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YAMAHA               RUN  2                                      - COLD CYCLE          K = 1.0000   W =    429.
-------------------------------------------------------------------------------------------------------------------
                 CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D   WEIGHTING         W E I G H T E D
MODE               HC       CO     CO2    NO(K)    FACTOR      HC      CO    NO(K)    FACTOR         HC       CO        NO(K)
-------------------------------------------------------------------------------------------------------------------
**CYCLF 1**
1 IDLE          7612.   2.010    5.310     81.     0.997     7593.   2.005    80.     0.042      318.913   0.084       3.393
2 0-25          5762.   0.790    7.120     85.     1.055     6081.   0.833    89.     0.244     1483.914   0.203      21.890
3 30            3028.   1.880   10.420    141.     0.991     3001.   1.863   139.     0.118      354.123   0.219      16.489
4 30-15         6471.   2.360    5.520    113.     1.059     6854.   2.499   119.     0.062      424.981   0.154       7.421
5 15            7885.   4.100    4.700     93.     0.949     7489.   3.894    88.     0.050      374.472   0.194       4.416
6 15-30         5015.   4.160    7.290    111.     0.980     4917.   4.079   108.     0.455     2237.658   1.856      49.527
7 50-20         9129.   4.380    3.030    113.     0.961     8778.   4.211   108.     0.029      254.570   0.122       3.151
SUM------------(CYCLE COMPOSITE)------------------------------------------------------------ 5448.632   2.835     106.290
**CYCLE 2**
1 IDLE          8469.   3.640    3.970    141.     0.970     8221.   3.533   136.     0.042      345.302   0.148       5.748
2 0-25          6391.   3.200    6.630    171.     0.958     6123.   3.066   163.     0.244     1494.246   0.748      39.980
3 30            3368.   1.550   10.830    161.     0.951     3203.   1.474   153.     0.118      378.065   0.173      18.072
4 30-15         6530.   1.320    6.930    160.     0.990     6466.   1.307   158.     0.062      400.922   0.081       9.823
5 15            5652.   0.450    7.780    117.     1.027     5808.   0.462   120.     0.050      290.428   0.023       6.012
6 15-30         4528.   2.120    8.130    158.     1.029     4662.   2.183   162.     0.455  .  2121.659   0.993      74.033
7 50-20         8732.   4.320    3.080    156.     0.988     8630.   4.269   154.     0.029      250.283   0.123       4.471
SUM------------(CYCLE COMPOSITE)------------------------------------------------------------ 5280.910   2.291     158.142
**CYCLE 3**
1 IDLE          8742.   4.010    3.770    165.     0.952     8330.   3.821   157.     0.042      349.878   0.160       6.603
2 0-25          7317.   3.940    6.650    176.     0.877     6421.   3.457   154.     0.244     1566.818   0.843      37.687
3 30            3794.   1.430   10.890    153.     0.923     3503.   1.320   141.     0.118      413.407   0.155      16.671
4 30-15         6003.   2.360    6.620    139.     1.015     6094.   2.395   141.     0.062      377.834   0.148       8.748
5 15            5566.   0.880    8.080    117.     0.997     5554.   0.878   116.     0.050      277.700   0.043       5.837
6 15-30         4779.   2.680    8.540    142.     0.964     4607.   2.583   136.     0.455     2096.189   1.175      62.284
7 50-20         8315.   4.680    2.860    138.     1.022     8502.   4.785   141.     0.029      246.573   0.138       4.092
SUM------------(CYCLE COMPOSITE)------------------------------------------------------------ 5328.402   2.666     141.925
**CYCLE 4**
1 IDLE          8780.   4.210    3.700    157.     0.948     8327.   3.993   148.     0.042      349.766   0.167       6.254
2 0-25          6401.   3.140    6.720    166.     0.953     6104.   2.994   158.     0.244     1489.615   0.730      38.630
3 30            4605.   2.420   10.480    169.     0.870     4007.   2.105   147.     0.118      472.841   0.248      17.352
4 30-15         5480.   2.250    7.280    150.     1.012     5547.   2.277   151.     0.062      343.949   0.141       9.414
5 15            5517.   0.510    8.180    129.     0.999     5616.   0.509   128.     0.050      280.823   0.025       6.449
6 15-30         4579.   2.550    7.500    148.     1.056     4839.   2.694   156.     0.455     2201.840   1.226      71.166
7 50-20         7860.   4.450    3.250    147.     1.038     8161.   4.620   152.     0.029      236.692   0.134       4.426
SUM------------(CYCLE COMPOSITE)------------------------------------------------------------ 5375.529   2.673     153.695
AVERAGE SUM OF CYCLES 1-4 ------------------------------------------------------------------ 5358.368   2.617     140.013
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YAMAHA               RUN  2                                      - COLD CYCLE          K = 1.0000   W =    429.
-------------------------------------------------------------------------------------------------------------------
                 CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D   WEIGHTING         W E I G H T E D
MODE               HC       CO     CO2    NO(K)    FACTOR      HC      CO    NO(K)    FACTOR         HC       CO        NO(K)
-------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE          6162.   4.430    3.700     81.     1.153     7108.   5.110    93.     0.042      298.541   0.214       3.924
2 0-25          4455.   3.540    7.290    140.     1.045     4656.   3.700   146.     0.244     1136.279   0.902      35.708
3 30            3493.   2.140   10.790    117.     0.927     3239.   1.984   108.     0.118      382.315   0.234      12.805
4 30-15         5944.   2.950    5.930    117.     1.048     6234.   3.094   122.     0.062      386.534   0.191       7.608
5 15            4817.   1.250    8.080    105.     1.042     5022.   1.303   109.     0.050      251.113   0.065       5.473
6 15-30         4652.   3.260    8.500    127.     0.956     4451.   3.119   121.     0.455     2025.290   1.419      55.290
7 50-20         6941.   4.580    3.130    127.     1.122     7792.   5.141   142.     0.029      225.969   0.149       4.134
SUM------------(CYCLE COMPOSITE)------------------------------------------------------------ 4706.044   3.177     124.945
**CYCLE 7**
1 IDLE          8677.   4.550    3.700    141.     0.944     8198.   4.299   133.     0.042      344.339   0.180       5.595
2 0-25          6982.   3.210    6.400    166.     0.932     6512.   2.994   154.     0.244     1589.027   0.730      37.779
3 30            4820.   1.790   10.170    153.     0.891     4295.   1.595   136.     0.118      506.866   0.188      16.089
4 30-15         6530.   2.640    8.090    139.     0.880     5751.   2.325   122.     0.062      356.598   0.144       7.590
5 15            5583.   1.160    8.290    117.     0.973     5433.   1.128   113.     0.050      271.662   0.056       5.693
6 15-30         4940.   2.780    8.480    132.     0.953     4710.   2.651   125.     0.455     2143.454   1.206      57.274
7 50-20         7569.   4.620    5.840    132.     0.888     6723.   4.103   117.     0.029      194.968   0.119       3.400
SUM------------(CYCLE COMPOSITE)------------------------------------------------------------ 5406.917   2.625     133.423
AVERAGE SUM OF CYCLES 6-7 ------------------------------------------------------------------ 5056.481   2.901     129.184
```

```
YAMAHA               RUN  2                                      - COLD CYCLE
-------------------------------------------------------------------------------------
CYCLE         CONCENTRATION AS DETERMINED       WEIGHTING           W   E   I   G   H   T   E   D
NUMBER          HC          CO          NO(K)       FACTOR             HC          CO           NO(K)
-------------------------------------------------------------------------------------
  1           5448.632     2.835      106.290      0.0875           476.755     0.248         9.300
  2           5280.910     2.291      158.142      0.0875           462.079     0.200        13.837
  3           5328.402     2.666      141.925      0.0875           466.235     0.233        12.418
  4           5375.529     2.673      153.695      0.0875           470.358     0.233        13.448
  6           4706.044     3.177      124.945      0.3250          1529.464     1.032        40.607
  7           5406.917     2.625      133.423      0.3250          1757.248     0.853        43.362
SUM------------(TRIP COMPOSITE)-------------------------------------- 5162.141     2.801       132.974
```

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)

```
YAMAHA               RUN   3                              B - COLD CYCLE          K = 1.0000   W =    429.
----------------------------------------------------------------------------------------------------------------
MODE          CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D   WEIGH/  3        W E I G H T E D
               HC      CO    CO2    NO(K)    FACTOR      HC      CO   NO(K)    FACTOR       HC        CO       NO(K)
----------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE        7490.  2.150   5.610   189.     0.981    7350.  2.110   185.     0.042     308.741   0.088      7.790
2 0-25        5440.  1.420   7.420   183.     1.035    5632.  1.470   189.     0.244    1374.255   0.358     46.229
3 30          3229.  1.880  10.600   190.     0.964    3115.  1.814   183.     0.118     367.651   0.214     21.633
4 30-15       6613.  2.740   4.290    76.     1.132    7490.  3.103    86.     0.062     464.385   0.192      5.336
5 15          5949.  1.000   7.810    23.     0.984    5854.  0.984    22.     0.050     292.707   0.049      1.131
6 15-30       4380.  2.550   8.250    45.     1.017    4455.  2.593    45.     0.455    2027.094   1.180     20.826
7 50-20       9220.  3.190   2.790    64.     1.010    9321.  3.225    64.     0.029     270.314   0.093      1.876
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------------   5105.151   2.176    104.824
**CYCLE 2**
1 IDLE        9296.  3.140   3.880    93.     0.936    8702.  2.939    87.     0.042     365.486   0.123      3.656
2 0-25        7051.  2.740   7.340   104.     0.888    6262.  2.433    92.     0.244    1528.105   0.593     22.539
3 30          3651.  1.800  13.040   105.     0.810    2960.  1.459    85.     0.118     349.316   0.172     10.046
4 30-15       6172.  2.600   5.640    94.     1.065    6577.  2.770   100.     0.062     407.814   0.171      6.211
5 15          5808.  0.730   8.080    69.     0.985    5722.  0.719    67.     0.050     286.105   0.035      3.398
6 15-30       4996.  2.260   8.570    96.     0.960    4798.  2.170    92.     0.455    2183.479   0.987     41.956
7 50-20       8562.  3.250   2.950   106.     1.049    8982.  3.409   111.     0.029     260.478   0.098      3.224
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------------   5380.786   2.183     91.032
**CYCLE 3**
1 IDLE        8823.  3.180   3.640   129.     0.982    8668.  3.124   126.     0.042     364.067   0.131      5.322
2 0-25        7132.  2.160   7.640   151.     0.882    6297.  1.907   133.     0.244    1536.484   0.465     32.530
3 30          4524.  1.780  11.560   117.     0.836    3783.  1.488    97.     0.118     446.504   0.175     11.547
4 30-15       6741.  2.530   5.580   229.     1.026    6919.  2.597   235.     0.062     429.029   0.161     14.574
5 15          5756.  1.000   8.500   105.     0.952    5484.  0.952   100.     0.050     274.248   0.047      5.002
6 15-30       5189.  2.570   8.220    63.     0.959    4979.  2.466    60.     0.455    2265.812   1.122     27.509
7 50-20       8213.  3.130   3.150   127.     1.067    8766.  3.340   135.     0.029     254.218   0.096      3.931
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------------   5570.364   2.199    100.419
**CYCLE 4**
1 IDLE        9395.  3.230   3.580   129.     0.945    8879.  3.052   121.     0.042     372.943   0.128      5.120
2 0-25        7316.  2.750   7.630   139.     0.857    6274.  2.358   119.     0.244    1531.029   0.575     29.088
3 30          4920.  2.490  11.000   117.     0.825    4062.  2.056    96.     0.118     479.430   0.242     11.401
4 30-15       6911.  2.810   5.360   117.     1.019    7042.  2.863   119.     0.062     436.646   0.177      7.392
5 15          5896.  1.890   8.390    93.     0.923    5444.  1.745    85.     0.050     272.221   0.087      4.293
6 15-30       5362.  2.700   8.610   117.     0.920    4936.  2.485   107.     0.455    2245.945   1.130     49.007
7 50-20       6855.  3.250   2.860   105.     1.219    8360.  3.963   128.     0.029     242.465   0.114      3.713
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------------   5580.681   2.457    110.017
AVERAGE SUM OF CYCLES 1-4 ------------------------------------------------------------   5409.246   2.254    101.573
```

```
YAMAHA               RUN   3                              B - COLD CYCLE          K = 1.0000   W =    429.
----------------------------------------------------------------------------------------------------------------
MODE          CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D   WEIGHTING        W E I G H T E D
               HC      CO    CO2    NO(K)    FACTOR      HC      CO   NO(K)    FACTOR       HC        CO       NO(K)
----------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE        5847.  3.370   3.840   141.     1.245    7283.  4.198   175.     0.042     305.918   0.176      7.377
2 0-25        5139.  2.740   7.560   150.     1.001    5146.  2.743   150.     0.244    1255.637   0.669     36.650
3 30          4330.  2.730  10.700   129.     0.866    3750.  2.364   111.     0.118     442.535   0.279     13.184
4 30-15       6251.  2.990   5.400   176.     1.062    6642.  3.177   187.     0.062     411.814   0.196     11.594
5 15          5122.  2.320   8.180   105.     0.975    4993.  2.262   102.     0.050     249.698   0.113      5.118
6 15-30       4751.  2.660   8.230    64.     0.986    4689.  2.625    63.     0.455    2133.588   1.194     28.741
7 50-20       7709.  3.370   2.990   121.     1.115    8598.  3.758   134.     0.029     249.342   0.109      3.913
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------------   5048.533   2.738    106.579
**CYCLE 7**
1 IDLE        9886.  3.370   3.700   129.     0.902    8924.  3.042   116.     0.042     374.836   0.127      4.891
2 0-25        7124.  2.760   7.310   138.     0.885    6304.  2.442   122.     0.244    1538.381   0.596     29.800
3 30          5004.  2.740  10.770   129.     0.826    4135.  2.264   106.     0.118     488.012   0.267     12.580
4 30-15       7022.  2.860   5.650   140.     0.988    6943.  2.828   138.     0.062     430.501   0.175      8.583
5 15          5904.  2.520   7.780   105.     0.940    5553.  2.370    98.     0.050     277.655   0.118      4.937
6 15-30       5127.  2.960   8.170    85.     0.954    4895.  2.826    81.     0.455    2227.235   1.285     36.925
7 50-20       7334.  3.540   3.050   104.     1.138    8346.  4.028   118.     0.029     242.054   0.116      3.432
SUM-----------(CYCLE COMPOSITE)-------------------------------------------------------   5578.675   2.687    101.150
AVERAGE SUM OF CYCLES 6-7 ------------------------------------------------------------   5313.604   2.712    103.865
```

```
YAMAHA               RUN   3                              B - COLD CYCLE
----------------------------------------------------------------------------------------
CYCLE        CONCENTRATION AS DETERMINED          WEIGHTING         W   E   I   G   H   T   E   D
NUMBER          HC          CO        NO(K)          FACTOR          HC           CO          NO(K)
----------------------------------------------------------------------------------------
  1          5105.151     2.176     104.824        0.0875          446.700      0.190        9.172
  2          5380.786     2.183      91.032        0.0875          470.818      0.191        7.965
  3          5570.364     2.199     100.419        0.0875          487.406      0.192        8.786
  4          5580.681     2.457     110.017        0.0875          488.309      0.214        9.626
  6          5048.533     2.738     106.579        0.3250         1640.773      0.889       34.638
  7          5578.675     2.687     101.150        0.3250         1813.069      0.873       32.873
SUM-----------(TRIP COMPOSITE)------------------------------------ 5347.078      2.552      103.063
```

```
DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
```

```
YAMAHA DTIE          RUN   4                                          - COLD CYCLE          K = 1.0000    W =    429.
------------------------------------------------------------------------------------------------------------------------
             CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D   WEIGHTING         W E I G H T E D
MODE            HC      CO     CO2    NO(K)    FACTOR      HC      CO    NO(K)    FACTOR          HC       CO        NO(K)
------------------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE       6462.   1.360   5.630     51.     1.091     7050.   1.483    55.     0.042       296.137   0.062      2.337
2 0-25       6210.   0.930   6.950     77.     1.026     6376.   0.954    79.     0.244      1555.820   0.232     19.291
3 30         3950.   3.820   9.420    125.     0.929     3672.   3.551   116.     0.118       433.345   0.419     13.713
4 30-15      3501.   2.410   8.680     88.     1.061     3714.   2.557    93.     0.062       230.307   0.158      5.788
5 15         5593.   0.430   8.140     77.     1.007     5633.   0.433    77.     0.050       281.681   0.021      3.677
6 15-30      4873.   2.360   8.570     85.     0.965     4706.   2.279    82.     0.455      2141.474   1.037     37.353
7 50-20      6881.   5.250   3.530     82.     1.067     7343.   5.602    87.     0.029       212.966   0.162      2.537
SUM-----------(CYCLE COMPOSITE)---------------------------------------------------------- 5151.732   2.094     84.900
**CYCLE 2**
1 IDLE       8685.   3.990   3.700     90.     0.961     8353.   3.837    86.     0.042       350.861   0.161      3.635
2 0-25       8223.   3.320   6.000    102.     0.876     7208.   2.910    89.     0.244      1758.857   0.710     21.817
3 30         5043.   2.260  10.970    103.     0.826     4167.   1.867    85.     0.118       491.756   0.220     10.043
4 30-15      4384.   2.040   9.440     84.     0.954     4183.   1.946    80.     0.062       259.380   0.120      4.969
5 15         5980.   0.700   8.480     77.     0.948     5671.   0.663    73.     0.050       283.581   0.033      3.651
6 15-30      5260.   2.310   8.750     90.     0.930     4893.   2.149    83.     0.455      2226.568   0.977     38.097
7 50-20      6889.   5.360   3.490     88.     1.065     7339.   5.710    93.     0.029       212.843   0.165      2.718
SUM-----------(CYCLF COMPOSITE)---------------------------------------------------------- 5583.848   2.389     84.934
**CYCLE 3**
1 IDLE       8407.   4.350   3.580     91.     0.977     8217.   4.251    88.     0.042       345.130   0.178      3.735
2 0-25       7871.   3.870   6.650    113.     0.848     6679.   3.284    95.     0.244      1629.879   0.801     23.399
3 30         5776.   1.550  11.440    117.     0.779     4502.   1.441    91.     0.118       531.241   0.170     10.760
4 30-15      4741.   2.560   8.510     98.     0.972     4610.   2.489    95.     0.062       285.853   0.154      5.908
5 15         5873.   0.550   8.500     90.     0.959     5632.   0.527    86.     0.050       281.649   0.026      4.316
6 15-30      5275.   2.980   8.390    107.     0.930     4910.   2.773    99.     0.455      2234.179   1.262     45.318
7 50-20      6497.   5.250   3.540     95.     1.100     7146.   5.775   104.     0.029       207.255   0.167      3.030
SUM-----------(CYCLE COMPOSITE)---------------------------------------------------------- 5515.189   2.760     96.470
**CYCLE 4**
1 IDLE       8211.   4.400   3.620    103.     0.987     8105.   4.343   101.     0.042       340.450   0.182      4.270
2 0-25       7386.   4.230   6.610    118.     0.868     6412.   3.672   102.     0.244      1564.594   0.896     24.996
3 30         5212.   2.000  11.720    117.     0.790     4118.   1.580    92.     0.118       486.007   0.186     10.909
4 30-15      4993.   2.680   8.900    103.     0.927     4631.   2.485    95.     0.062       287.140   0.154      5.923
5 15         6300.   1.150   8.680     90.     0.902     5688.   1.038    81.     0.050       284.419   0.051      4.063
6 15-30      5510.   3.430   8.460    113.     0.899     4954.   3.084   101.     0.455      2254.289   1.403     46.231
7 50-20      6490.   5.120   4.800    100.     1.009     6549.   5.166   100.     0.029       189.923   0.149      2.926
SUM-----------(CYCLE COMPOSITE)---------------------------------------------------------- 5406.826   3.024     99.321
AVFRAGF SUM OF CYCLES 1-4 --------------------------------------------------------------- 5414.398   2.566     91.406
```

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YAMAHA DTIE          RUN   4                                          - COLD CYCLE          K = 1.0000    W =    429.
------------------------------------------------------------------------------------------------------------------------
             CONCENTRATION  AS  MEASURED  DILUTION     A D J U S T E D   WEIGHTING         W E I G H T E D
MODE            HC      CO     CO2    NO(K)    FACTOR      HC      CO    NO(K)    FACTOR          HC       CO        NO(K)
------------------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLF       4423.   4.400   3.560     51.     1.376     6086.   6.054    70.     0.042       255.637   0.254      2.947
2 0-25       4702.   3.990   5.930     76.     1.123     5283.   4.483    85.     0.244      1289.271   1.094     20.839
3 30         3189.   2.140  11.480    103.     0.906     2891.   1.940    93.     0.118       341.149   0.228     11.018
4 30-15      3208.   2.560   8.910     98.     1.061     3406.   2.718   104.     0.062       211.209   0.168      6.452
5 15         4924.   0.970   8.750     90.     0.996     4906.   0.966    89.     0.050       245.304   0.048      4.483
6 15-30      4364.   3.200   8.690    105.     0.966     4217.   3.092   101.     0.455      1919.033   1.407     46.172
7 50-20      5961.   5.320   4.800     96.     1.043     6219.   5.550   100.     0.029       180.358   0.160      2.904
SUM-----------(CYCLE COMPOSITE)---------------------------------------------------------- 4441.963   3.362     94.818
**CYCLE 7**
1 IDLE       7575.   4.120   4.390    103.     0.991     7507.   4.083   102.     0.042       315.301   0.171      4.287
2 0-25       7111.   3.330   6.330    136.     0.925     6578.   3.080   125.     0.244      1605.034   0.751     30.696
3 30         5001.   2.250  11.480    103.     0.805     4027.   1.811    82.     0.118       475.212   0.213      9.787
4 30-15      4933.   2.500   9.450    103.     0.904     4462.   2.261    93.     0.062       276.694   0.140      5.777
5 15         5996.   1.130   8.680     90.     0.922     5530.   1.042    83.     0.050       276.521   0.052      4.150
6 15-30      5383.   3.020   8.620    110.     0.909     4895.   2.746   100.     0.455      2227.492   1.249     45.518
7 50-20      6420.   5.410   3.560    100.     1.098     7053.   5.943   109.     0.029       204.537   0.172      3.185
SUM-----------(CYCLE COMPOSITE)---------------------------------------------------------- 5380.794   2.751    103.403
AVERAGE SUM OF CYCLFS 6-7 --------------------------------------------------------------- 4911.379   3.056     99.110
```

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YAMAHA DTIE          RUN   4                                 - COLD CYCLE
----------------------------------------------------------------------------------------
CYCLE       CONCENTRATION AS DETERMINED       WEIGHTING         W   E   I   G   H   T   E   D
NUMBER         HC           CO         NO(K)       FACTOR          HC          CO          NO(K)
----------------------------------------------------------------------------------------
  1         5151.732      2.094       84.900      0.0875        450.776     0.183        7.428
  2         5583.848      2.389       84.934      0.0875        488.586     0.209        7.431
  3         5515.189      2.760       96.470      0.0875        482.579     0.241        8.441
  4         5406.826      3.024       99.321      0.0875        473.097     0.264        8.690
  6         4441.963      3.362       94.818      0.3250       1443.638     1.092       30.816
  7         5380.794      2.751      103.403      0.3250       1748.758     0.894       33.606
SUM------------(TRIP COMPOSITE)------------------------------- 5087.436     2.885       96.414
```

```
DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
```

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YAMAHA DTIE        RUN  5                                  - COLD CYCLE          K = 1.0000   W =    429.
-------------------------------------------------------------------------------------------------------------
MODE           CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D    WEIGHTING       W E I G H T E D
                 HC      CO     CO2     NO(K)    FACTOR     HC      CO   NO(K)    FACTOR        HC       CO      NO(K)
-------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE          7997.  2.600   4.640     51.     0.994    7954.  2.586    50.     0.042     334.105  0.108     2.130
2 0-25          7332.  2.070   6.750     67.     0.923    6770.  1.911    61.     0.244    1651.893  0.466    15.095
3 30            3503.  2.230  10.410    103.     0.947    3318.  2.112    97.     0.118     391.529  0.249    11.512
4 30-15         3443.  1.910   8.410     94.     1.108    3815.  2.116   104.     0.062     236.578  0.131     6.459
5 15            7090.  0.450   7.680    157.     0.931    6606.  0.419   146.     0.050     330.303  0.020     7.314
6 15-30         5080.  2.800   8.410     77.     0.947    4815.  2.654    72.     0.455    2191.058  1.207    33.210
7 50-20         8562.  4.990   3.210     74.     0.969    8303.  4.839    71.     0.029     240.792  0.140     2.081
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------   5376.261  2.324    77.803
**CYCLE 2**
1 IDLE          9434.  4.070   3.560     77.     0.918    8666.  3.738    70.     0.042     364.002  0.157     2.970
2 0-25          8813.  3.540   5.750     92.     0.851    7500.  3.012    78.     0.244    1830.045  0.735    19.104
3 30            3567.  1.500  11.580    103.     0.890    3176.  1.335    91.     0.118     374.831  0.157    10.823
4 30-15         3708.  2.200   8.890     96.     1.036    3841.  2.279    99.     0.062     238.197  0.141     6.166
5 15            7521.  1.080   7.910     77.     0.874    6580.  0.944    67.     0.050     329.018  0.047     3.368
6 15-30         5545.  2.880   8.580     96.     0.905    5022.  2.608    86.     0.455    2285.217  1.186    39.563
7 50-20         8087.  5.050   3.380     81.     0.990    8010.  5.002    80.     0.029     232.296  0.145     2.326
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------   5653.610  2.570    84.324
**CYCLE 3**
1 IDLE          9833.  4.400   3.350     90.     0.896    8817.  3.945    80.     0.042     370.342  0.165     3.389
2 0-25          9323.  4.290   5.640    113.     0.812    7571.  3.484    91.     0.244    1847.489  0.850    22.392
3 30            4226.  1.900  11.440     99.     0.855    3614.  1.624    84.     0.118     426.486  0.191     9.991
4 30-15         3801.  2.170   8.720    108.     1.042    3962.  2.262   112.     0.062     245.656  0.140     6.979
5 15            7764.  1.380   8.200     77.     0.839    6516.  1.158    64.     0.050     325.838  0.057     3.231
6 15-30         6081.  3.250   8.400     96.     0.873    5314.  2.840    83.     0.455    2417.926  1.292    38.171
7 50-20         7430.  5.210   3.650     92.     1.015    7544.  5.290    93.     0.029     218.798  0.153     2.709
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------   5852.537  2.851    86.865
**CYCLE 4**
1 IDLE          9662.  4.600   3.370    103.     0.900    8699.  4.141    92.     0.042     365.363  0.173     3.894
2 0-25          8854.  4.330   6.060    115.     0.815    7217.  3.529    93.     0.244    1761.111  0.861    22.874
3 30            4226.  2.160  11.480    117.     0.846    3578.  1.829    99.     0.118     422.252  0.215    11.690
4 30-15         3780.  2.580   9.390     99.     0.982    3712.  2.534    97.     0.062     230.194  0.157     6.028
5 15            8199.  1.560   7.990     90.     0.822    6745.  1.283    74.     0.050     337.265  0.064     3.702
6 15-30         5807.  3.020   8.620    104.     0.884    5133.  2.669    91.     0.455    2335.856  1.214    41.833
7 50-20         7533.  4.330   3.580     98.     1.044    7869.  4.523   102.     0.029     228.234  0.131     2.968
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------   5680.247  2.818    92.993
AVERAGE SUM OF CYCLES 1-4 -----------------------------------------------------------   5640.664  2.641    85.496
```

```
YAMAHA DTIE        RUN  5                                  - COLD CYCLE          K = 1.0000   W =    429.
-------------------------------------------------------------------------------------------------------------
MODF           CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D    WEIGHTING       W E I G H T E D
                 HC      CO     CO2     NO(K)    FACTOR     HC      CO   NO(K)    FACTOR        HC       CO      NO(K)
-------------------------------------------------------------------------------------------------------------
**CYCLF 6**
1 IDLE          8289.  4.690   3.200     90.     1.000    8290.  4.690    90.     0.042     348.207  0.197     3.780
2 0-25          7296.  3.790   6.820    105.     0.873    6375.  3.311    91.     0.244    1555.513  0.808    22.386
3 30            3127.  2.020  11.400    103.     0.918    2872.  1.855    94.     0.118     338.901  0.218    11.163
4 30-15         3344.  2.710   8.550    103.     1.072    3587.  2.907   110.     0.062     222.413  0.180     6.850
5 15            6995.  1.760   8.270    103.     0.868    6071.  1.527    89.     0.050     303.591  0.076     4.470
6 15-30         5166.  3.490   8.450    111.     0.919    4748.  3.208   102.     0.455    2160.649  1.459    46.425
7 50-20         7360.  5.040   3.490    113.     1.038    7645.  5.235   117.     0.029     221.715  0.151     3.404
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------   5150.991  3.092    98.480
**CYCLE 7**
1 IDLE          9475.  4.540   3.450    129.     0.908    8612.  4.126   117.     0.042     361.704  0.173     4.924
2 0-25          8687.  4.730   5.970    115.     0.818    7109.  3.871    94.     0.244    1734.756  0.944    22.965
3 30            3536.  2.300  11.360    129.     0.887    3139.  2.042   114.     0.118     370.515  0.241    13.517
4 30-15         3651.  2.820   8.450    127.     1.050    3835.  2.962   133.     0.062     237.791  0.183     8.271
5 15            7067.  2.480   7.850    117.     0.867    6127.  2.150   101.     0.050     306.390  0.107     5.072
6 15-30         5681.  4.020   8.270    133.     0.883    5018.  3.550   117.     0.455    2283.234  1.615    53.453
7 50-20         7658.  5.410   3.470    124.     1.003    7686.  5.430   124.     0.029     222.917  0.157     3.609
SUM-----------(CYCLE COMPOSITE)------------------------------------------------------   5517.310  3.423   111.813
AVERAGE SUM OF CYCLES 6-7 -----------------------------------------------------------   5334.151  3.257   105.146
```

```
YAMAHA DTIE        RUN  5                                  - COLD CYCLE
-----------------------------------------------------------------------------------------------
CYCLE       CONCENTRATION AS DETERMINED       WEIGHTING         W   E   I   G   H   T   E   D
NUMBER        HC          CO          NO(K)      FACTOR          HC          CO           NO(K)
-----------------------------------------------------------------------------------------------
  1         5376.261     2.324       77.803      0.0875        470.422      0.203         6.807
  2         5653.610     2.570       84.324      0.0875        494.690      0.224         7.378
  3         5852.537     2.851       86.865      0.0875        512.097      0.249         7.600
  4         5680.247     2.818       92.993      0.0875        497.021      0.246         8.136
  6         5150.991     3.092       98.480      0.3250       1674.072      1.004        32.006
  7         5517.310     3.423      111.813      0.3250       1793.125      1.112        36.339
SUM-----------(TRIP COMPOSITE)--------------------------------  5441.430      3.041        98.269
```

DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)

```
YAMAHA DTIE          RUN-6                                    S - COLD CYCLE          K = 1.0000   W =    429.
--------------------------------------------------------------------------------------------------------------
MODE           CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D   WEIGHTING       W E I G H T E D
                 HC      CO    CO2    NO(K)    FACTOR     HC       CO   NO(K)    FACTOR         HC      CO       NO(K)
--------------------------------------------------------------------------------------------------------------
**CYCLE 1**
1 IDLE         5093.  1.380   5.630    51.     1.226    6247.  1.692    62.     0.042       262.396  0.071      2.627
2 0-25         5082.  1.240   7.290    30.     1.082    5499.  1.341    32.     0.244      1341.943  0.327      7.921
3 30           4047.  1.380  11.240   104.     0.889    3599.  1.227    92.     0.118       424.791  0.144     10.916
4 30-15        3742.  1.540   8.730    90.     1.070    4006.  1.649    96.     0.062       248.428  0.102      5.975
5 15           4975.  0.360   8.000    64.     1.069    5322.  0.385    68.     0.050       266.131  0.019      3.423
6 15-30        4361.  2.830   8.690    90.     0.978    4268.  2.769    88.     0.455      1942.081  1.260     40.079
7 50-20        5741.  5.030   3.560    73.     1.181    6781.  5.941    86.     0.029       196.662  0.172      2.500
SUM------------(CYCLE COMPOSITE)------------------------------------------------------ 4682.434  2.097     73.444
**CYCLE 2**
1 IDLE         7030.  3.750   4.190    77.     1.061    7463.  3.981    81.     0.042       313.476  0.167      3.433
2 0-25         6982.  3.150   6.350    93.     0.937    6546.  2.953    87.     0.244      1597.246  0.720     21.275
3 30           4821.  1.810  11.860   104.     0.806    3889.  1.460    83.     0.118       458.984  0.172      9.901
4 30-15        4470.  2.040   9.420    98.     0.949    4245.  1.937    93.     0.062       263.206  0.120      5.770
5 15           5862.  0.600   8.520    77.     0.957    5610.  0.574    73.     0.050       280.506  0.028      3.684
6 15-30        4984.  2.230   8.860    89.     0.944    4705.  2.105    84.     0.455      2141.069  0.957     38.233
7 50-20        5909.  5.170   2.810    85.     1.231    7275.  6.365   104.     0.029       210.986  0.184      3.035
SUM------------(CYCLE COMPOSITE)------------------------------------------------------ 5265.477  2.351     85.333
**CYCLE 3**
1 IDLE         7302.  4.160   3.810    90.     1.052    7685.  4.378    94.     0.042       322.798  0.183      3.978
2 0-25         6966.  4.220   6.040   120.     0.925    6444.  3.904   111.     0.244      1572.466  0.952     27.088
3 30           4770.  1.420  12.090   117.     0.807    3852.  1.146    94.     0.118       454.637  0.135     11.151
4 30-15        4756.  1.930   9.590    93.     0.906    4312.  1.749    84.     0.062       267.373  0.108      5.228
5 15           5879.  1.070   8.700    77.     0.930    5469.  0.995    71.     0.050       273.497  0.049      3.582
6 15-30        5229.  3.530   8.480   105.     0.912    4770.  3.220    95.     0.455      2170.754  1.465     43.589
7 50-20        6243.  5.330   3.750    85.     1.102    6880.  5.873    93.     0.029       199.520  0.170      2.716
SUM------------(CYCLE COMPOSITE)------------------------------------------------------ 5261.045  3.065     97.334
**CYCLE 4**
1 IDLE         7310.  4.350   3.740    90.     1.049    7675.  4.567    94.     0.042       322.264  0.191      3.968
2 0-25         7140.  4.580   6.270   127.     0.891    6362.  4.081   113.     0.244      1552.517  0.995     27.614
3 30           4890.  0.820  12.510   117.     0.796    3895.  0.653    93.     0.118       459.683  0.077     10.999
4 30-15        4842.  2.370   8.300   100.     0.985    4771.  2.335    98.     0.062       295.830  0.144      6.109
5 15           6477.  0.890   9.000    90.     0.881    5712.  0.784    79.     0.050       285.631  0.039      3.968
6 15-30        5395.  3.980   8.440   100.     0.891    4812.  3.549    89.     0.455      2189.480  1.615     40.583
7 50-20        6320.  5.210   3.610    91.     1.111    7027.  5.793   101.     0.029       203.791  0.167      2.934
SUM------------(CYCLE COMPOSITE)------------------------------------------------------ 5309.299  3.232     96.178
AVERAGE SUM OF CYCLES 1-4 ------------------------------------------------------------ 5129.564  2.486     88.072
```

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YAMAHA DTIE          RUN-6                                    S - COLD CYCLE          K = 1.0000   W =    429.
--------------------------------------------------------------------------------------------------------------
MODE           CONCENTRATION  AS  MEASURED  DILUTION      A D J U S T E D   WEIGHTING       W E I G H T E D
                 HC      CO    CO2    NO(K)    FACTOR     HC       CO   NO(K)    FACTOR         HC      CO       NO(K)
--------------------------------------------------------------------------------------------------------------
**CYCLE 6**
1 IDLE         4096.  4.500   3.560    77.     1.416    5803.  6.376   109.     0.042       243.750  0.267      4.582
2 0-25         4217.  3.560   6.610   123.     1.120    4723.  3.987   137.     0.244      1152.605  0.973     33.618
3 30           2682.  2.690  11.130   112.     0.943    2529.  2.537   105.     0.118       298.531  0.299     12.466
4 30-15        2706.  2.580   8.570   100.     1.134    3069.  2.926   113.     0.062       190.314  0.191      7.033
5 15           4890.  1.840   8.600   103.     0.979    4790.  1.802   100.     0.050       239.524  0.090      5.045
6 15-30        4063.  4.150   8.270   126.     0.984    3998.  4.084   124.     0.455      1919.423  1.858     56.423
7 50-20        5545.  5.320   3.640   110.     1.179    6542.  6.277   129.     0.029       189.742  0.182      3.764
SUM------------(CYCLE COMPOSITE)------------------------------------------------------ 4133.893  3.852    122.933
**CYCLE 7**
1 IDLE         7011.  4.640   3.500   103.     1.082    7591.  5.023   111.     0.042       318.827  0.211      4.663
2 0-25         6706.  3.930   6.550   132.     0.920    6170.  3.616   121.     0.244      1505.686  0.882     29.637
3 30           4689.  2.930  11.200   117.     0.817    3834.  2.396    95.     0.118       452.525  0.282     11.291
4 30-15        4521.  2.700   8.570   119.     0.979    4428.  2.644   116.     0.062       274.570  0.163      7.227
5 15           6192.  1.230   8.500   103.     0.917    5681.  1.128    94.     0.050       284.084  0.056      4.725
6 15-30        5377.  4.280   8.250   114.     0.895    4813.  3.831   102.     0.455      2190.183  1.743     46.434
7 50-20        6290.  5.380   3.440   108.     1.122    7057.  6.036   121.     0.029       204.666  0.175      3.514
SUM------------(CYCLE COMPOSITE)------------------------------------------------------ 5230.544  3.514    107.514
AVERAGE SUM OF CYCLES 6-7 ------------------------------------------------------------ 4682.219  3.683    115.224
```

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YAMAHA DTIE          RUN-6                                    S - COLD CYCLE
-------------------------------------------------------------------------------------
CYCLE        CONCENTRATION AS DETERMINED       WEIGHTING          W  E  I  G  H  T  E  D
NUMBER          HC          CO        NO(K)       FACTOR           HC         CO         NO(K)
-------------------------------------------------------------------------------------
  1          4682.434     2.097      73.444      0.0875         409.713     0.183       6.426
  2          5265.477     2.351      85.333      0.0875         460.729     0.205       7.466
  3          5261.045     3.065      97.334      0.0875         460.341     0.268       8.516
  4          5309.299     3.232      96.178      0.0875         464.563     0.282       9.415
  6          4133.893     3.852     122.933      0.3250        1343.515     1.251      39.953
  7          5230.544     3.514     107.514      0.3250        1699.926     1.142      34.942
SUM------------(TRIP COMPOSITE)--------------------------- 4838.789     3.334     105.721
```

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DILUTION FACTOR = 14.5/(CO2+0.5*CO+10.8*HC)
```

PETRO CH
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APPENDIX C

Motorcycle LA-4 Emissions Data
(1975 Federal Light-Duty Vehicle Procedure)

```
HARLEY-DAVIDSON FLH MOTORCYCLE
RUN 1     10/29/71

VO IS             .069207

INPUTS AND RESULTS FOR BAG 1
HCD               48              HCE             1500
CODM              41.46           COEM            9888.11
NOD               1.4             NOE             16
NOXD              1.8             NOXE            17.5
CO2D              .05             CO2M            1.18
RPM               11293           T               110
P                 1               H               104
R                 90
VMIX              704.736         K               1.15781
COD               40.2548         COE             9376.05
DF                5.90932
HC-C              1460.12         HC-MASS         16.8036
NOX-C             16.0046         NOX-MASS        .707273
CO-C              9342.61         CO-MASS         217.077

INPUTS AND RESULTS FOR BAG 3
HCD               56              HCE             1150
CODM              193.77          COEM            10047.
NOD               1.5             NOE             13.5
NOXD              1.8             NOXE            15
CO2D              .05             CO2M            1.12
RPM               11017           T               114
P                 1               H               104
R                 90
VMIX              682.721         K               1.15781
COD               188.137         COE             9538.28
DF                6.122
HC-C              1103.15         HC-MASS         12.2988
NOX-C             13.494          NOX-MASS        .577697
CO-C              9380.88         CO-MASS         211.157

INPUTS AND RESULTS FOR BAG 2
HCD               48              HCE             1200
CODM              41.46           COEM            8566.6
NOD               1.4             NOE             5
NOXD              1.8             NOXE            6
CO2D              .05             CO2M            .7
RPM               18872           T               112
P                 1               H               104
R                 90
VMIX              1173.58         K               1.15781
COD               40.2548         COE             8202.13
DF                8.16967
HC-C              1157.88         HC-MASS         22.1902
NOX-C             4.42033         NOX-MASS        .3253
CO-C              8166.81         CO-MASS         315.998

HC-WM             4.85681
NOX-WM            .127829
CO-WM             70.6268
```

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HARLEY-DAVIDSON FLH MOTORCYCLE
RUN 2      10/30/71

VO IS              .069207

INPUTS AND RESULTS FOR BAG 1
HCD                43              HCE              1450
CODM               117.01          COEM             10539.5
NOD                1               NOE              16.5
NOXD               1.5             NOXE             17.5
CO2D               .05             CO2M             1.22
RPM                11140           T                110
P                  1               H                77
R                  59
VMIX               694.472         K                1.00949
COD                114.78          COE              10091.2
DF                 5.6442
HC-C               1414.62         HC-MASS          16.0428
NOX-C              16.2658         NOX-MASS         .617603
CO-C               9996.72         CO-MASS          228.892

INPUTS AND RESULTS FOR BAG 3
HCD                43              HCE              1400
CODM               74.89           COEM             9426.65
NOD                1               NOE              14
NOXD               1.5             NOXE             15
CO2D               .04             CO2M             1.1
RPM                11304           T                113
P                  1               H                77
R                  59
VMIX               701.006         K                1.00949
COD                73.4628         COE              9047.4
DF                 6.24784
HC-C               1363.88         HC-MASS          15.6129
NOX-C              13.7401         NOX-MASS         .526613
CO-C               8985.69         CO-MASS          207.679

INPUTS AND RESULTS FOR BAG 2
HCD                43              HCE              1500
CODM               117.01          COEM             10372.6
NOD                1               NOE              5
NOXD               1.5             NOXE             6.5
CO2D               .05             CO2M             .84
RPM                18935           T                111
P                  1               H                77
R                  59
VMIX               1178.35         K                1.00949
COD                114.78          COE              10007.2
DF                 6.73122
HC-C               1463.39         HC-MASS          28.1591
NOX-C              5.22284         NOX-MASS         .336481
CO-C               9909.5          CO-MASS          384.985

HC-WM              5.86092
NOX-WM             .120296
CO-WM              80.2381
```

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HARLEY-DAVIDS0N M0T0RCYCLE
RUN 3      11/1/71

V0 IS              .069207

INPUTS AND RESULTS F0R BAG 1
HCD                30               HCE              1600
C0DM               49.8             C0EM             11418.1
N0D                .4               N0E              16
N0XD               .6               N0XE             18
C02D               .06              C02M             1.36
RPM                11003            T                110
P                  1                H                73
R                  65
VMIX               684.045          K                .990688
C0D                48.7544          C0E              10879.4
DF                 5.13815
HC-C               1575.84          HC-MASS          17.6028
N0X-C              17.5168          N0X-MASS         .642916
C0-C               10840.1          C0-MASS          244.477

INPUTS AND RESULTS F0R BAG 3
HCD                28               HCE              1500
C0DM               66.51            C0EM             11236.3
N0D                .2               N0E              15
N0XD               .4               N0XE             16.5
C02D               .05              C02M             1.31
RPM                11229            T                111
P                  1                H                73
R                  65
VMIX               696.873          K                .990688
C0D                65.1136          C0E              10717.
DF                 5.29289
HC-C               1477.29          HC-MASS          16.8115
N0X-C              16.1756          N0X-MASS         .604823
C0-C               10664.2          C0-MASS          245.019

INPUTS AND RESULTS F0R BAG 2
HCD                30               HCE              1450
C0DM               49.8             C0EM             9578.01
N0D                .4               N0E              4.5
N0XD               .6               N0XE             5.8
C02D               .06              C02M             .83
RPM                18905            T                112
P                  1                H                73
R                  65
VMIX               1171.19          K                .990688
C0D                48.7544          C0E              9223.89
DF                 7.06234
HC-C               1424.25          HC-MASS          27.2396
N0X-C              5.28496          N0X-MASS         .332113
C0-C               9182.04          C0-MASS          354.558

HC-WM              5.91885
N0X-WM             .127109
C0-WM              79.9125
```

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HONDA CL350K3 MOTORCYCLE
RUN 1      10/29/71

VO IS               .069207

INPUTS AND RESULTS FOR BAG 1
HCD                 40              HCE              1100
CODM                33.14           COEM             7534.46
NOD                 .8              NOE              6.4
NOXD                1               NOXE             7.6
CO2D                .04             CO2M             .66
RPM                 11446           T                115
P                   1               H                104
R                   90
VMIX                708.072         K                1.15781
COD                 32.1766         COE              7219.71
DF                  8.98141
HC-C                1064.45         HC-MASS          12.3081
NOX-C               6.71134         NOX-MASS         .297991
CO-C                7191.11         CO-MASS          167.878

INPUTS AND RESULTS FOR BAG 3
HCD                 43              HCE              1030
CODM                41.46           COEM             6834.52
NOD                 1               NOE              6.8
NOXD                1.2             NOXE             8
CO2D                .03             CO2M             .63
RPM                 11384           T                117
P                   1               H                104
R                   90
VMIX                701.796         K                1.15781
COD                 40.2548         COE              6552.95
DF                  9.65212
HC-C                991.455         HC-MASS          11.3624
NOX-C               6.92432         NOX-MASS         .304722
CO-C                6516.87         CO-MASS          150.789

INPUTS AND RESULTS FOR BAG 2
HCD                 40              HCE              940
CODM                33.14           COEM             5131
NOD                 .8              NOE              2.6
NOXD                1               NOXE             3.4
CO2D                .04             CO2M             .45
RPM                 18858           T                117
P                   1               H                104
R                   90
VMIX                1162.55         K                1.15781
COD                 32.1766         COE              4937.39
DF                  12.9127
HC-C                903.098         HC-MASS          17.1448
NOX-C               2.47744         NOX-MASS         .180606
CO-C                4907.71         CO-MASS          188.109

HC-WM               3.85518
NOX-WM              6.43244 E-2
CO-WM               46.1661
```

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HØNDA CL350K3 MØTØRCYCLE
RUN 2       10/30/71

VO IS                 .069207

INPUTS AND RESULTS FØR BAG 1
HCD                   30                 HCE               1250
CØDM                  66.51              CØEM              7907.4
NOD                   1.5                NØE               7.5
NØXD                  2                  NØXE              8.5
CØ2D                  .04                CØ2M              .69
RPM                   10701              T                 112
P                     1                  H                 77
R                     59
VMIX                  664.772            K                 1.00949
CØD                   65.2425            CØE               7651.68
DF                    8.48011
HC-C                  1223.54            HC-MASS           13.2824
NØX-C                 6.73585            NØX-MASS          .244819
CØ-C                  7594.13            CØ-MASS           166.445

INPUTS AND RESULTS FØR BAG 3
HCD                   25                 HCE               1150
CØDM                  41.46              CØEM              6947.16
NOD                   1.5                NØE               7.5
NØXD                  3.5                NØXE              9
CØ2D                  .06                CØ2M              .64
RPM                   11237              T                 112
P                     1                  H                 77
R                     59
VMIX                  698.069            K                 1.00949
CØD                   40.6699            CØE               6729.18
DF                    9.38429
HC-C                  1127.66            HC-MASS           12.8548
NØX-C                 5.87296            NØX-MASS          .224149
CØ-C                  6692.84            CØ-MASS           154.038

INPUTS AND RESULTS FØR BAG 2
HCD                   30                 HCE               950
CØDM                  66.51              CØEM              4953.65
NOD                   1.5                NØE               3
NØXD                  2                  NØXE              4
CØ2D                  .04                CØ2M              .44
RPM                   18813              T                 112
P                     1                  H                 77
R                     59
VMIX                  1168.71            K                 1.00949
CØD                   65.2425            CØE               4817.29
DF                    13.1795
HC-C                  922.276            HC-MASS           17.6017
NØX-C                 2.15175            NØX-MASS          .137492
CØ-C                  4757.              CØ-MASS           183.298

HC-WM                 4.08537
NØX-WM                4.94039 E-2
CØ-WM                 45.6895
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HONDA CL350K3 MØTØRCYCLE
RUN 3      11/1/71

VO IS              .069207

INPUTS AND RESULTS FØR BAG 1
HCD                57               HCE              1200
CØDM               117.01           CØEM             7413.67
NOD                .2               NØE              5.3
NØXD               .5               NØXE             6.5
CØ2D               .05              CØ2M             .68
RPM                11142            T                109
P                  1                H                74
R                  65
VMIX               693.904          K                .995322
CØD                114.553          CØE              7160.98
DF                 8.83848
HC-C               1149.45          HC-MASS          13.0249
NØX-C              6.05657          NØX-MASS         .226552
CØ-C               7059.38          CØ-MASS          161.505

INPUTS AND RESULTS FØR BAG 3
HCD                45               HCE              1200
CØDM               100.12           CØEM             7413.67
NOD                .5               NØE              4.2
NØXD               .7               NØXE             5.2
CØ2D               .05              CØ2M             .59
RPM                11206            T                115
P                  1                H                74
R                  65
VMIX               690.607          K                .995322
CØD                98.018           CØE              7173.82
DF                 9.38782
HC-C               1159.79          HC-MASS          13.0797
NØX-C              4.57456          NØX-MASS         .170303
CØ-C               7086.24          CØ-MASS          161.349

INPUTS AND RESULTS FØR BAG 2
HCD                57               HCE              1000
CØDM               117.01           CØEM             5312.75
NOD                .2               NØE              1.6
NØXD               .5               NØXE             2.5
CØ2D               .05              CØ2M             .45
RPM                18877            T                109
P                  1                H                74
R                  65
VMIX               1175.63          K                .995322
CØD                114.553          CØE              5155.19
DF                 12.576
HC-C               947.532          HC-MASS          18.1907
NØX-C              2.03976          NØX-MASS         .129268
CØ-C               5049.74          CØ-MASS          195.73

HC-WM              4.16625
NØX-WM             4.31677 E-2
CØ-WM              47.6195
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HONDA SL-100 MOTORCYCLE
RUN 1      8/15/72

VO IS              7.55355E-2

INPUTS AND RESULTS FOR BAG 1
HCD                30                 HCE                638
CODM               3                  COEM               3487
NOD                0                  NOE                32
NOXD               .1                 NOXE               39
CO2D               .05                CO2M               .66
RPM                11925              T                  106
P                  3.8                H                  70
R                  57
VMIX               814.429            K                  .97704
COD                2.94477            COE                3378.5
DF                 12.6219
HC-C               610.377            HC-MASS            8.11778
NOX-C              38.9079            NOX-MASS           1.6768
CO-C               3375.79            CO-MASS            90.6457

INPUTS AND RESULTS FOR BAG 3
HCD                25                 HCE                536
CODM               8                  COEM               2465
NOD                .1                 NOE                32.8
NOXD               .3                 NOXE               43.5
CO2D               .03                CO2M               .6
RPM                12182              T                  114
P                  3.8                H                  70
R                  57
VMIX               820.385            K                  .97704
COD                7.85271            COE                2391.15
DF                 15.0104
HC-C               512.666            HC-MASS            6.86812
NOX-C              43.22              NOX-MASS           1.87626
CO-C               2383.82            CO-MASS            64.4777

INPUTS AND RESULTS FOR BAG 2
HCD                30                 HCE                466
CODM               3                  COEM               3246
NOD                0                  NOE                8.4
NOXD               .1                 NOXE               9.6
CO2D               .05                CO2M               .37
RPM                18187              T                  108
P                  3.8                H                  70
R                  57
VMIX               1237.72            K                  .97704
COD                2.94477            COE                3163.12
DF                 18.2832
HC-C               437.641            HC-MASS            8.84561
NOX-C              9.50547            NOX-MASS           .62257
CO-C               3160.33            CO-MASS            128.966

HC-WM              2.16681
NOX-WM             .321742
CO-WM              27.2928
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HONDA SL-100 MOTORCYCLE
RUN 4      8/18/72

VO IS              7.55355E-2

INPUTS AND RESULTS FOR BAG 1
HCD                36               HCE            523
CODM               2                COEM           2004
NOD                .4               NOE            18.8
NOXD               1.2              NOXE           46.1
CO2D               .04              CO2M           .57
RPM                11430            T              120
P                  3.8              H              70
R                  52
VMIX               758.627          K              .97704
COD                1.96641          COE            1948.35
DF                 16.3988
HC-C               489.195          HC-MASS        6.06034
NOX-C              44.9732          NOX-MASS       1.8054
CO-C               1946.51          CO-MASS        48.6859

INPUTS AND RESULTS FOR BAG 3
HCD                31               HCE            418
CODM               2                COEM           1691
NOD                .3               NOE            23.9
NOXD               1                NOXE           49.8
CO2D               .04              CO2M           .53
RPM                10855            T              120
P                  3.8              H              70
R                  52
VMIX               720.464          K              .97704
COD                1.96641          COE            1645.35
DF                 18.1982
HC-C               388.703          HC-MASS        4.57316
NOX-C              48.855           NOX-MASS       1.86257
CO-C               1643.49          CO-MASS        39.0389

INPUTS AND RESULTS FOR BAG 2
HCD                36               HCE            356
CODM               2                COEM           1794
NOD                .4               NOE            10.8
NOXD               1.2              NOXE           16.8
CO2D               .04              CO2M           .33
RPM                18987            T              119
P                  3.8              H              70
R                  52
VMIX               1262.37          K              .97704
COD                1.96641          COE            1752.47
DF                 24.7759
HC-C               321.453          HC-MASS        6.62662
NOX-C              15.6484          NOX-MASS       1.04532
CO-C               1750.58          CO-MASS        72.8602

HC-WM              1.57857
NOX-WM             .384441
CO-WM              15.473
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HONDA SL-100 MOTORCYCLE
RUN 5      8/21/72

VO IS               7.55355E-2

INPUTS AND RESULTS FOR BAG 1
HCD                 40             HCE            685
CODM                25             COEM           2654
NOD                 .6             NOE            20.1
NOXD                1.4            NOXE           36.2
CO2D                .03            CO2M           .55
RPM                 11386          T              121
P                   3.8            H              93
R                   62
VMIX                753.361        K              1.09242
COD                 24.4993        COE            2572.75
DF                  15.3007
HC-C                647.614        HC-MASS        7.9672
NOX-C               34.8915        NOX-MASS       1.55522
CO-C                2549.85        CO-MASS        63.3341

INPUTS AND RESULTS FOR BAG 3
HCD                 30             HCE            616
CODM                31             COEM           3452
NOD                 .3             NOE            19.3
NOXD                1.3            NOXE           27.8
CO2D                .03            CO2M           .53
RPM                 11260          T              121
P                   3.8            H              93
R                   62
VMIX                745.025        K              1.09242
COD                 30.3792        COE            3347.65
DF                  14.4651
HC-C                588.074        HC-MASS        7.15466
NOX-C               26.5899        NOX-MASS       1.17207
CO-C                3319.37        CO-MASS        81.5353

INPUTS AND RESULTS FOR BAG 2
HCD                 40             HCE            500
CODM                25             COEM           2993
NOD                 .6             NOE            7.9
NOXD                1.4            NOXE           10.1
CO2D                .03            CO2M           .34
RPM                 18890          T              119
P                   3.8            H              93
R                   62
VMIX                1254.19        K              1.09242
COD                 24.4993        COE            2913.47
DF                  19.6669
HC-C                462.034        HC-MASS        9.46285
NOX-C               8.77119        NOX-MASS       .65036
CO-C                2890.22        CO-MASS        119.512

HC-WM               2.26225
NOX-WM              .265025
CO-WM               25.7628
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HONDA SL-100 MOTORCYCLE
RUN 6      8/22/72

VO IS                 7.55355E-2

INPUTS AND RESULTS FOR BAG 1
HCD                   34                HCE              781
CODM                  0                 COEM             2288
NOD                   0                 NOE              19.6
NOXD                  .3                NOXE             42.5
CO2D                  .05               CO2M             .64
RPM                   11717             T                120
P                     3.8               H                81
R                     63
VMIX                  776.868           K                1.02902
COD                   0                 COE              2213.25
DF                    14.264
HC-C                  749.384           HC-MASS          9.50687
NOX-C                 42.221            NOX-MASS         1.82801
CO-C                  2213.25           CO-MASS          56.6888

INPUTS AND RESULTS FOR BAG 3
HCD                   36                HCE              548
CODM                  2                 COEM             2350
NOD                   0                 NOE              22.1
NOXD                  .4                NOXE             37.4
CO2D                  .04               CO2M             .55
RPM                   11600             T                121
P                     3.8               H                81
R                     63
VMIX                  767.787           K                1.02902
COD                   1.9593            COE              2277.3
DF                    16.0955
HC-C                  514.237           HC-MASS          6.44748
NOX-C                 37.0249           NOX-MASS         1.58429
CO-C                  2275.46           CO-MASS          57.6009

INPUTS AND RESULTS FOR BAG 2
HCD                   34                HCE              433
CODM                  0                 COEM             2260
NOD                   0                 NOE              10.2
NOXD                  .3                NOXE             14
CO2D                  .05               CO2M             .39
RPM                   18953             T                119
P                     3.8               H                81
R                     63
VMIX                  1258.8            K                1.02902
COD                   0                 COE              2197.04
DF                    20.5205
HC-C                  400.657           HC-MASS          8.23601
NOX-C                 13.7146           NOX-MASS         .962152
CO-C                  2197.04           CO-MASS          91.1835

HC-VM                 2.1332
NOX-VM                .353499
CO-VM                 19.7856
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KAWASAKI 125F-6 M0T0RCYCLE
RUN 1      8/15/72

V0 IS               7.55355E-2

INPUTS AND RESULTS F0R BAG 1
HCD                 24                 HCE             3400
C0DM                5                  C0EM            1089
NOD                 0                  N0E             8.4
N0XD                .9                 N0XE            20.1
C02D                .06                C02M            .6
RPM                 13145              T               100
P                   3.8                H               70
R                   57
VMIX                907.368            K               .97704
C0D                 4.90794            C0E             1056.37
DF                  12.8152
HC-C                3377.87            HC-MASS         50.051
N0X-C               19.2702            N0X-MASS        .925255
C0-C                1051.85            C0-MASS         31.467

INPUTS AND RESULTS F0R BAG 3
HCD                 32                 HCE             3800
C0DM                5                 COEM             1685
NOD                 .1                 N0E             14.1
N0XD                .9                 N0XE            23.3
C02D                .06                C02M            .6
RPM                 11796              T               117
P                   3.8                H               70
R                   57
VMIX                790.26             K               .97704
C0D                 4.90794            C0E             1634.52
DF                  11.7189
HC-C                3770.73            HC-MASS         48.6611
N0X-C               22.4768            NOX-MASS        .939929
C0-C                1630.03            C0-MASS         42.4701

INPUTS AND RESULTS F0R BAG 2
HCD                 24                 HCE             2040
C0DM                5                  C0EM            304
NOD                 0                  N0E             4.2
N0XD                .9                 N0XE            8.1
C02D                .06                C02M            .45
RPM                 19726              T               104
P                   3.8                H               70
R                   57
VMIX                1351.98            K               .97704
C0D                 4.90794            C0E             295.77
DF                  19.6028
HC-C                2017.22            HC-MASS         44.536
N0X-C               7.24591            N0X-MASS        .518388
C0-C                291.112            C0-MASS         12.9763

HC-WM               12.506
NOX-WM              .193601
C0-WM               6.76201
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KAWASAKI 125F-6 MOTORCYCLE
RUN 3      8/17/72

VO IS              7.55355E-2

INPUTS AND RESULTS FOR BAG 1
HCD                24                 HCE               2950
CODM               3                  COEM              1532
NOD                .2                 NOE               11.8
NOXD               1.9                NOXE              17.5
CO2D               .03                CO2M              .5
RPM                11449              T                 120
P                  3.8                H                 80
R                  66
VMIX               761.73             K                 1.02407
COD                2.93605            COE               1484.6
DF                 14.203
HC-C               2927.69            HC-MASS           36.4177
NOX-C              15.7338            NOX-MASS          .664723
CO-C               1481.87            CO-MASS           37.2159

INPUTS AND RESULTS FOR BAG 3
HCD                25                 HCE               2810
CODM               2                  COEM              1632
NOD                .7                 NOE               12.8
NOXD               5.1                NOXE              19.7
CO2D               .05                CO2M              .48
RPM                11387              T                 120
P                  3.8                H                 80
R                  66
VMIX               757.605            K                 1.02407
COD                1.95736            COE               1582.13
DF                 14.5777
HC-C               2786.71            HC-MASS           34.4764
NOX-C              14.9498            NOX-MASS          .628183
CO-C               1580.31            CO-MASS           39.4733

INPUTS AND RESULTS FOR BAG 2
HCD                24                 HCE               1530
CODM               3                  COEM              610
NOD                .2                 NOE               5.7
NOXD               1.9                NOXE              8.6
CO2D               .03                CO2M              .35
RPM                19043              T                 119
P                  3.8                H                 80
R                  66
VMIX               1269.17            K                 1.02407
COD                2.93605            COE               592.886
DF                 23.8312
HC-C               1507.01            HC-MASS           31.2334
NOX-C              6.77973            NOX-MASS          .47724
CO-C               590.073            CO-MASS           24.6913

HC-WM              8.87261
NOX-WM             .149485
CO-WM              8.42585
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KAWASAKI 125F-6 M0T0RCYCLE
RUN 4      8/18/72

V0 IS              7.55355E-2

INPUTS AND RESULTS F0R BAG 1
HCD                41               HCE               3000
C0DM               9                C0EM              1564
N0D                0                N0E               10.3
N0XD               .6               N0XE              17.7
C02D               .04              C02M              .54
RPM                11305            T                 120
P                  3.8              H                 79
R                  61
VMIX               751.63           K                 1.01916
C0D                8.82267          C0E               1516.93
DF                 13.5123
HC-C               2962.03          HC-MASS           36.3564
N0X-C              17.1444          N0X-MASS          .711291
C0-C               1508.76          C0-MASS           37.3889

INPUTS AND RESULTS F0R BAG 3
HCD                26               HCE               2910
C0DM               2                C0EM              1487
N0D                .4               N0E               12.7
N0XD               2                N0XE              18.3
C02D               .03              C02M              .5
RPM                11285            T                 120
P                  3.8              H                 79
R                  61
VMIX               750.3            K                 1.01916
C0D                1.96059          C0E               1443.39
DF                 14.3264
HC-C               2885.81          HC-MASS           35.3582
N0X-C              16.4396          N0X-MASS          .680844
C0-C               1441.57          C0-MASS           35.6606

INPUTS AND RESULTS F0R BAG 2
HCD                41               HCE               1520
C0DM               9                C0EM              632
N0D                0                N0E               4.7
N0XD               .6               N0XE              7.2
C02D               .04              C02M              .35
RPM                18954            T                 119
P                  3.8              H                 79
R                  61
VMIX               1262.36          K                 1.01916
C0D                8.82267          C0E               615.29
DF                 23.7787
HC-C               1480.72          HC-MASS           30.5242
N0X-C              6.62523          N0X-MASS          .461643
C0-C               606.838          C0-MASS           25.2566

HC-WM              8.84154
N0X-WM             .154077
C0-WM              8.22138
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KAWASAKI 125F-6 M0T0RCYCLE
RUN 5     8/21/72

VO IS           7.55355E-2

INPUTS AND RESULTS F0R BAG 1
HCD             26            HCE             3010
C0DM            11            C0EM            1461
NOD             0             N0E             10.1
N0XD            .4            N0XE            15.8
C02D            .05           C02M            ..57
RPM             11258         T               120
P               3.8           H               83
R               66
VMIX            749.023       K               1.03907
C0D             10.7655       C0E             1413.82
DF              13.2361
HC-C            2985.96       HC-MASS         36.5229
N0X-C           15.4302       N0X-MASS        .650414
C0-C            1403.87       C0-MASS         34.669

INPUTS AND RESULTS F0R BAG 3
HCD             35            HCE             2750
C0DM            44            C0EM            1451
NOD             0             N0E             11.7
N0XD            .4            N0XE            16.6
C02D            .04           C02M            .53
RPM             11137         T               120
P               3.8           H               83
R               66
VMIX            740.972       K               1.03907
C0D             43.062        C0E             1405.26
DF              14.172
HC-C            2717.47       HC-MASS         32.8816
N0X-C           16.2282       N0X-MASS        .6767
C0-C            1365.24       C0-MASS         33.3526

INPUTS AND RESULTS F0R BAG 2
HCD             26            HCE             1590
C0DM            11            C0EM            559
NOD             0             N0E             4.9
N0XD            .4            N0XE            7.3
C02D            .05           C02M            .41
RPM             18990         T               119
P               3.8           H               83
R               66
VMIX            1265.63       K               1.03907
C0D             10.7655       C0E             542.671
DF              21.4996
HC-C            1565.21       HC-MASS         32.3494
N0X-C           6.9186        N0X-MASS        .492776
C0-C            532.407       C0-MASS         22.2162

HC-WM           8.90624
N0X-WM          .154423
C0-WM           7.48465
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SUZUKI T250 M0T0RCYCLE
RUN 2      11/16/71

VO IS                 .069207

INPUTS AND RESULTS F0R BAG 1
HCD                   12              HCE               6250
C0DM                  8               C0EM              7177
NOD                   .2              N0E               1.9
N0XD                  .4              N0XE              4.4
C02D                  .03             C02M              .77
RPM                   11147           T                 111
P                     1               H                 75
R                     62
VMIX                  692.261         K                 1
C0D                   7.83979         C0E               6926.89
DF                    6.41858
HC-C                  6239.87         HC-MASS           70.5393
N0X-C                 4.06232         N0X-MASS          .152308
C0-C                  6920.27         C0-MASS           157.947

INPUTS AND RESULTS F0R BAG 3
HCD                   13.5            HCE               6550
C0DM                  8               C0EM              7657
NOD                   .1              N0E               1.7
N0XD                  .4              N0XE              4.6
C02D                  .04             C02M              .71
RPM                   11133           T                 111
P                     1               H                 75
R                     62
VMIX                  691.391         K                 1
C0D                   7.83979         C0E               7399.01
DF                    6.3661
HC-C                  6538.62         HC-MASS           73.8238
N0X-C                 4.26283         N0X-MASS          .159625
C0-C                  7392.4          C0-MASS           168.511

INPUTS AND RESULTS F0R BAG 2
HCD                   12              HCE               3550
C0DM                  8               C0EM              2438
NOD                   .2              N0E               .9
N0XD                  .4              N0XE              2.2
C02D                  .03             C02M              .51
RPM                   18865           T                 111
P                     1               H                 75
R                     62
VMIX                  1171.57         K                 1
C0D                   7.83979         C0E               2365.24
DF                    12.165
HC-C                  3538.99         HC-MASS           67.707
N0X-C                 1.83288         N0X-MASS          .1163
C0-C                  2358.05         C0-MASS           91.0835

HC-WM                 18.6825
N0X-WM                3.63705 E-2
C0-WM                 34.0069
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SUZUKI T250 MOTORCYCLE
RUN 3      11/17/71

VO IS               .069207

INPUTS AND RESULTS FOR BAG 1
HCD                 63                  HCE             6700
CODM                50                  COEM            6294
NOD                 .1                  NOE             1.5
NOXD                .4                  NOXE            4.1
C02D                .05                 C02M            .67
RPM                 11200               T               117
P                   1                   H               75
R                   56
VMIX                685.475             K               1
COD                 49.0956             COE             6098.98
DF                  6.87216
HC-C                6646.17             HC-MASS         74.3959
NOX-C               3.75821             NOX-MASS        .139525
CO-C                6057.03             CO-MASS         136.889

INPUTS AND RESULTS FOR BAG 3
HCD                 21.5                HCE             7000
CODM                17                  COEM            6614
NOD                 .1                  NOE             1.7
NOXD                .4                  NOXE            4.2
C02D                .02                 C02M            .66
RPM                 11068               T               113
P                   1                   H               75
R                   56
VMIX                682.125             K               1
COD                 16.6925             COE             6410.34
DF                  6.69654
HC-C                6981.71             HC-MASS         77.7699
NOX-C               3.85973             NOX-MASS        .142593
CO-C                6396.14             CO-MASS         143.847

INPUTS AND RESULTS FOR BAG 2
HCD                 63                  HCE             3800
CODM                50                  COEM            2151
NOD                 .1                  NOE             1.6
NOXD                .4                  NOXE            2.1
C02D                .05                 C02M            .46
RPM                 19024               T               115
P                   1                   H               75
R                   56
VMIX                1168.38             K               1
COD                 49.0956             COE             2093.05
DF                  12.7704
HC-C                3741.93             HC-MASS         71.3946
NOX-C               1.73132             NOX-MASS        .109557
CO-C                2047.79             CO-MASS         78.8839

HC-WM               19.6952
NOX-WM              3.34441 E-2
CO-WM               29.2985
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SUZUKI T250 M0T0RCYCLE
RUN 4      11/18/71

VO IS               .069207

INPUTS AND RESULTS F0R BAG 1
HCD                 30              HCE             8100
C0DM                8               C0EM            8165
NOD                 .1              N0E             2.5
N0XD                .5              N0XE            5.7
C02D                .03             C02M            .8
RPM                 11338           T               112
P                   1               H               55
R                   52
VMIX                703.617         K               .914077
C0D                 7.86563         C0E             7902.12
DF                  5.58284
HC-C                8075.37         HC-MASS         92.7866
N0X-C               5.28956         N0X-MASS        .184254
C0-C                7895.66         C0-MASS         183.166

INPUTS AND RESULTS F0R BAG 3
HCD                 30              HCE             8400
C0DM                17              C0EM            9131
NOD                 .1              N0E             2.4
N0XD                .6              N0XE            6.4
C02D                .06             C02M            .77
RPM                 11159           T               112
P                   1               H               55
R                   52
VMIX                692.509         K               .914077
C0D                 16.7145         C0E             8842.29
DF                  5.3724
HC-C                8375.58         HC-MASS         94.7167
N0X-C               5.91168         N0X-MASS        .202674
C0-C                8828.69         C0-MASS         201.577

INPUTS AND RESULTS F0R BAG 2
HCD                 30              HCE             4400
C0DM                8               C0EM            3029
NOD                 .1              N0E             1.2
N0XD                .5              N0XE            2.8
C02D                .03             C02M            .53
RPM                 18923           T               113
P                   1               H               55
R                   52
VMIX                1172.28         K               .914077
C0D                 7.86563         C0E             2947.22
DF                  10.5952
HC-C                4372.83         HC-MASS         83.7106
N0X-C               2.34719         N0X-MASS        .13622
C0-C                2940.1          C0-MASS         113.635

HC-WM               23.6797
N0X-WM              4.41298 E-2
C0-WM               40.9727
```

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TRIUMPH T120R MOTORCYCLE
RUN 1      11/3/71

VO IS              .069207

INPUTS AND RESULTS FOR BAG 1
HCD                12            HCE            1300
CODM               17            COEM           6835
NOD                .2            NOE            12
NOXD               .4            NOXE           13.5
CO2D               .04           CO2M           .68
RPM                11264         T              104
P                  1             H              60
R                  53
VMIX               716.257       K              .934143
COD                16.709        COE            6628.52
DF                 9.09799
HC-C               1289.32       HC-MASS        15.0805
NOX-C              13.144        NOX-MASS       .476308
CO-C               6613.65       CO-MASS        156.181

INPUTS AND RESULTS FOR BAG 3
HCD                13            HCE            1400
CODM               25            COEM           6506
NOD                .8            NOE            11.5
NOXD               1             NOXE           12.5
CO2D               .05           CO2M           .63
RPM                11424         T              103
P                  1             H              60
R                  53
VMIX               727.722       K              .934143
COD                24.572        COE            6315.72
DF                 9.56069
HC-C               1388.36       HC-MASS        16.4988
NOX-C              11.6046       NOX-MASS       .427255
CO-C               6293.72       CO-MASS        151.005

INPUTS AND RESULTS FOR BAG 2
HCD                12            HCE            1250
CODM               17            COEM           5042
NOD                .2            NOE            4.7
NOXD               .4            NOXE           5.4
CO2D               .04           CO2M           .47
RPM                18849         T              103
P                  1             H              60
R                  53
VMIX               1200.7        K              .934143
COD                16.709        COE            4910.07
DF                 12.3388
HC-C               1238.97       HC-MASS        24.2931
NOX-C              5.03242       NOX-MASS       .305706
CO-C               4894.71       CO-MASS        193.768

HC-WM              5.35761
NOX-WM             .100541
CO-WM              46.2665
```

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TRIUMPH T120R M0T0RCYCLE
RUN 2      11/4/71

VO IS               .069207

INPUTS AND RESULTS F0R BAG 1
HCD                 14                HCE               1300
C0DM                33                C0EM              6190
NOD                 .1                N0E               13.5
N0XD                .4                N0XE              15
C02D                .05               C02M              .74
RPM                 11265             T                 103
P                   1                 H                 43
R                   45
VMIX                719.548           K                 .869263
C0D                 32.5203           C0E               6011.85
DF                  9.1083
HC-C                1287.54           HC-MASS           15.1288
N0X-C               14.6439           N0X-MASS          .496075
C0-C                5982.9            C0-MASS           141.935

INPUTS AND RESULTS F0R BAG 3
HCD                 18                HCE               1500
C0DM                58                C0EM              6506
NOD                 .2                N0E               13
N0XD                .3                N0XE              14
C02D                .05               C02M              .66
RPM                 11410             T                 103
P                   1                 H                 43
R                   45
VMIX                728.81            K                 .869263
C0D                 57.157            C0E               6328.78
DF                  9.287
HC-C                1483.94           HC-MASS           17.661
N0X-C               13.7323           N0X-MASS          .471181
C0-C                6277.77           C0-MASS           150.848

INPUTS AND RESULTS F0R BAG 2
HCD                 14                HCE               1200
C0DM                33                C0EM              5221
NOD                 .1                N0E               4.7
N0XD                .4                N0XE              5.6
C02D                .05               C02M              .51
RPM                 18887             T                 103
P                   1                 H                 43
R                   45
VMIX                1206.4            K                 .869263
C0D                 32.5203           C0E               5093.86
DF                  11.7607
HC-C                1187.19           HC-MASS           23.3883
N0X-C               5.23401           N0X-MASS          .297273
C0-C                5064.1            C0-MASS           201.425

HC-WM               5.32806
N0X-WM              .103888
C0-WM               46.4587
```

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TRIUMPH T120R MOTORCYCLE
RUN 3      11/5/71

VO IS              .069207

INPUTS AND RESULTS FOR BAG 1
HCD                9.5              HCE              1450
CODM               17               COEM             6506
NOD                .2               NOE              13.5
NOXD               .3               NOXE             15
CO2D               .04              CO2M             .75
RPM                11310            T                110
P                  1                H                64
R                  57
VMIX               707.493          K                .950841
COD                16.687           COE              6292.29
DF                 8.79133
HC-C               1441.58          HC-MASS          16.6551
NOX-C              14.7341          NOX-MASS         .536825
CO-C               6277.5           CO-MASS          146.429

INPUTS AND RESULTS FOR BAG 3
HCD                11               HCE              1450
CODM               25               COEM             6190
NOD                .2               NOE              12
NOXD               .4               NOXE             14.5
CO2D               .04              CO2M             .73
RPM                11447            T                109
P                  1                H                64
R                  57
VMIX               719.778          K                .950841
COD                24.5397          COE              5989.05
DF                 9.09149
HC-C               1440.21          HC-MASS          16.9282
NOX-C              14.144           NOX-MASS         .524273
CO-C               5967.21          CO-MASS          141.608

INPUTS AND RESULTS FOR BAG 2
HCD                9.5              HCE              1300
CODM               17               COEM             5221
NOD                .2               NOE              5.4
NOXD               .3               NOXE             6
CO2D               .04              CO2M             .53
RPM                18887            T                110
P                  1                H                64
R                  57
VMIX               1185.52          K                .950841
COD                16.687           COE              5071.61
DF                 11.4809
HC-C               1291.33          HC-MASS          24.9994
NOX-C              5.72613          NOX-MASS         .349587
CO-C               5056.38          CO-MASS          197.636

HC-WM              5.57469
NOX-WM             .117234
CO-WM              45.5089
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YAMAHA DT1-E MOTORCYCLE
RUN 3      11/18/71

VO IS              .069207

INPUTS AND RESULTS FOR BAG 1
HCD                28.5          HCE              5900
CODM               17            COEM             5690
NOD                .1            NOE              2.4
NOXD               .6            NOXE             4.4
CO2D               .06           CO2M             .9
RPM                11157         T                109
P                  1             H                61
R                  50
VMIX               695.317       K                .938262
COD                16.7254       COE              5499.53
DF                 6.56878
HC-C               5875.84       HC-MASS          66.7174
NOX-C              3.89134       NOX-MASS         .137494
CO-C               5485.35       CO-MASS          125.749

INPUTS AND RESULTS FOR BAG 3
HCD                20            HCE              5800
CODM               25            COEM             6190
NOD                .1            NOE              2.5
NOXD               .5            NOXE             4
CO2D               .04           CO2M             .82
RPM                11160         T                109
P                  1             H                61
R                  50
VMIX               695.504       K                .938262
COD                24.5962       COE              5992.32
DF                 6.70257
HC-C               5782.98       HC-MASS          65.6807
NOX-C              3.5746        NOX-MASS         .126337
CO-C               5971.4        CO-MASS          136.929

INPUTS AND RESULTS FOR BAG 2
HCD                28.5          HCE              3150
CODM               17            COEM             2174
NOD                .1            NOE              1.9
NOXD               .6            NOXE             3.6
CO2D               .06           CO2M             .56
RPM                18993         T                109
P                  1             H                61
R                  50
VMIX               1183.67       K                .938262
COD                16.7254       COE              2115.45
DF                 12.3327
HC-C               3123.81       HC-MASS          60.3809
NOX-C              3.04865       NOX-MASS         .183375
CO-C               2100.08       CO-MASS          81.9568

HC-WM              16.8677
NOX-WM             4.19346 E-2
CO-WM              28.5438
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YAMAHA DT1-E MOTORCYCLE
RUN 4      11/18/71

V0 IS            .069207

INPUTS AND RESULTS FOR BAG 1
HCD              31             HCE             6200
CODM             17             COEM            5788
NOD              .2             NOE             2.4
NOXD             .8             NOXE            4.4
CO2D             .03            CO2M            .86
RPM              11124          T               106
P                1              H               62
R                63
VMIX             698.855        K               .942418
COD              16.6541        COE             5574.4
DF               6.57688
HC-C             6173.71        HC-MASS         70.4563
NOX-C            3.72164        NOX-MASS        .132753
CO-C             5560.28        CO-MASS         128.116

INPUTS AND RESULTS FOR BAG 3
HCD              32             HCE             5300
CODM             8              COEM            5886
NOD              .2             NOE             2.8
NOXD             .6             NOXE            4.6
CO2D             .04            CO2M            .8
RPM              11159          T               109
P                1              H               62
R                63
VMIX             697.358        K               .942418
COD              7.83721        COE             5675.58
DF               7.06171
HC-C             5272.53        HC-MASS         60.0428
NOX-C            4.08497        NOX-MASS        .145401
CO-C             5668.85        CO-MASS         130.338

INPUTS AND RESULTS FOR BAG 2
HCD              31             HCE             3300
CODM             17             COEM            2081
NOD              .2             NOE             2.1
NOXD             .8             NOXE            2.6
CO2D             .03            CO2M            .51
RPM              19126          T               107
P                1              H               62
R                63
VMIX             1199.45        K               .942418
COD              16.6541        COE             2018.22
DF               12.8621
HC-C             3271.41        HC-MASS         64.0774
NOX-C            1.8622         NOX-MASS        .114007
CO-C             2002.86        CO-MASS         79.2053

HC-WM            17.1464
NOX-WM           3.38626 E-2
CO-WM            27.8117
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YAMAHA DT1-E M0T0RCYCLE
RUN 5      11/19/71

V0 IS              .069207

INPUTS AND RESULTS F0R BAG 1
HCD                8.5             HCE             5100
C0DM               8               C0EM            4507
NOD                .4              N0E             7.8
N0XD               .8              N0XE            4.7
C02D               .05             C02M            .84
RPM                11139           T               106
P                  1               H               41
R                  37
VMIX               704.604         K               .862218
C0D                7.90439         C0E             4380.26
DF                 7.4943
HC-C               5092.63         HC-MASS         58.5968
N0X-C              4.00675         N0X-MASS        .131836
C0-C               4373.41         C0-MASS         101.598

INPUTS AND RESULTS F0R BAG 3
HCD                7.5             HCE             4600
C0DM               8               C0EM            5221
NOD                .2              N0E             6.4
N0XD               .4              N0XE            9.6
C02D               .05             C02M            .77
RPM                11055           T               107
P                  1               H               41
R                  37
VMIX               698.058         K               .862218
C0D                7.90439         C0E             5081.22
DF                 7.70947
HC-C               4593.47         HC-MASS         52.3623
N0X-C              9.25188         N0X-MASS        .30159
C0-C               5074.34         C0-MASS         116.786

INPUTS AND RESULTS F0R BAG 2
HCD                8.5             HCE             3150
C0DM               8               C0EM            1523
NOD                .4              N0E             2.7
N0XD               .8              N0XE            4.4
C02D               .05             C02M            .51
RPM                18862           T               106
P                  1               H               41
R                  37
VMIX               1193.13         K               .862218
C0D                7.90439         C0E             1489.85
DF                 13.7579
HC-C               3142.12         HC-MASS         61.2203
N0X-C              3.65815         N0X-MASS        .203819
C0-C               1482.52         C0-MASS         58.3184

HC-WM              15.5018
N0X-WM             5.76552 E-2
C0-WM              22.4764
```

APPENDIX D

Gaseous Emissions Data from Steady-State Tests on Motorcycles

CONSTANT-SPEED EMISSIONS TEST DATA HARLEY-DAVIDSON FLH Motorcycle

Date 10/4/71 Atmospheric Pressure 29.24 in Hg Wet Bulb Temp. 64 °F Dry Bulb Temp. 72 °F

RUN No. 2

			Engine	Dyno	FIA	NDIR			C.L.		Polar.	Temperatures, °F		Fuel Rate,
Mode	Condition	Gear	rpm	hp	HC, ppm C	CO, %	CO_2, %	NO, ppm	NO_x, ppm	NO, ppm	O_2, %	Inlet	Exhaust	lbm/hr
1	Idle	—	—	—	12,000	4.96	5.60	57	78	28	6.6	76	125	2.72
2	20 RL	1	2970	—	9,200	7.48	6.65	60	50	37	3.2	76	240	4.94
3	30 RL	2	2690	—	8,400	8.25	6.50	60	45	32	3.2	77	300	7.53
4	40 RL	3	2420	—	7,400	9.02	6.35	63	52	39	3.4	77	325	7.10
5	50 RL	4	2460	—	5,400	8.39	6.81	85	67	56	3.2	77	340	7.90
6	20 5%	1	2970	4.1	8,000	8.71	6.50	74	54	45	3.2	77	310	8.75
7	30 5%	2	2690	6.0	5,600	8.55	6.81	82	62	51	3.2	77	345	7.42
8	40 5%	3	2420	8.3	4,200	7.17	7.63	121	93	87	3.0	77	350	7.65
9	50 5%	4	2460	10.1	3,400	5.25	9.06	202	190	185	2.9	77	400	7.31
10	20 10%	1	2970	6.3	9,000	8.71	6.65	63	51	42	3.0	76	250	7.77
11	30 10%	2	2690	9.3	3,600	6.13	8.33	1[illegible]0	120	116	2.9	75	350	7.90
12	40 10%	3	2420	12.8	2,000	0.51	11.75	—	1459	1375	3.1	75	430	6.80
13	50 10%	4	2460	15.7	3,200	6.27	8.69	240	269	269	2.5	75	460	10.65
14	20 20%	1	2970	10.7	3,200	5.40	9.44	187	185	185	2.6	75	445	8.16
15	30 20%	2	2690	15.9	3,200	5.69	9.44	278	306	278	2.3	75	475	10.20
16	0.6Max. RL	1	3360	—	10,800	9.50	6.35	67	48	35	2.9	75	425	8.30
17	0.6Max. $\frac{1}{3}$	1	3360	13.9	1,600	0.38	12.68	—	927	890	2.1	75	†500+	10.88
18	0.6Max. $\frac{2}{3}$	1	3360	25.8	3,700	9.02	7.80	92	153	139	1.8	75	†500+	23.33
19	0.8Max. RL	1	4480	—	2,500	4.68	9.83	49	91	88	2.1	75	450	12.89
20	0.8Max. $\frac{1}{3}$	1	4480	17.8	3,300	7.02	8.50	63	120	116	1.6	75	†500+	20.41
21	0.8Max. $\frac{2}{3}$	1	4480	33.1	3,100	9.66	7.30	57	107	97	1.4	75	†500+	30.62
22	Idle	—	—	—	24,400	8.09	5.18	28	23	12	5.1	75	220	3.16

†over 500°F, out of range of pyrometer

CONSTANT - SPEED EMISSIONS TEST DATA HARLEY - DAVIDSON FLH Motorcycle

Date 10/5/71 Atmospheric Pressure 29.30 in Hg Wet Bulb Temp. 64 °F Dry Bulb Temp. 73 °F

RUN No. 3

Mode	Condition	Gear	Engine rpm	Dyno hp	FIA	NDIR			C. L.		Polar.	Temperatures, °F		Fuel Rate, lbm/hr
					HC, ppmC	CO, %	CO_2, %	NO, ppm	NO_x, ppm	NO, ppm	O_2, %	Inlet	Exhaust	
1	Idle	—	—	—	9,800	4.81	5.88	53	35	33	7.2	75	135	2.57
2	20 RL	1	2970	—	7,400	8.22	6.49	56	45	34	3.9	75	145	8.44
3	30 RL	2	2690	—	7,000	8.37	6.18	49	45	32	4.2	75	185	7.42
4	40 RL	3	2420	—	7,200	9.15	6.33	49	45	31	3.9	78	235	7.10
5	50 RL	4	2460	—	5,400	8.53	6.63	67	66	58	3.8	78	290	7.31
6	20 5%	1	2970	4.1	6,200	8.53	6.79	42	48	38	3.8	75	245	8.75
7	30 5%	2	2690	6.0	3,200	7.30	7.78	78	75	69	3.7	74	325	8.03
8	40 5%	3	2420	8.3	3,400	7.46	7.95	81	91	88	3.4	74	335	8.16
9	50 5%	4	2460	10.1	2,800	4.67	9.61	187	199	194	3.4	74	350	7.53
10	20 10%	1	2970	6.3	2,750	6.71	7.95	78	88	85	3.3	74	285	8.30
11	30 10%	2	2690	9.3	2,400	4.81	7.45	179	180	176	3.3	74	390	8.03
12	40 10%	3	2420	12.8	1,600	1.15	11.48	1061	1109	1081	3.1	74	400	7.10
13	50 10%	4	2460	15.7	2,750	7.60	8.31	179	166	162	2.7	74	410	10.20
14	20 20%	1	2970	10.7	2,100	3.14	10.41	162	277	259	3.2	74	380	8.44
15	30 20%	2	2690	15.9	2,900	5.67	9.22	346	323	314	2.8	74	485	11.13
16	0.6Max. RL	1	3360	—	8,500	9.00	6.49	56	51	39	3.6	73	390	8.59
17	0.6Max. $\frac{1}{3}$	1	3360	13.9	2,900	4.81	10.21	277	259	240	2.3	73	500	10.88
18	0.6Max. $\frac{2}{3}$	1	3360	25.8	3,500	7.76	8.13	194	171	166	2.0	73	[1]500+	16.89
19	0.8Max. RL	1	4480	—	3,600	7.30	8.48	78	78	74	2.1	74	440	9.07
20	0.8Max. $\frac{1}{3}$	1	4480	17.8	4,100	8.06	8.31	114	106	102	1.8	74	[1]500+	18.14
21	0.8Max. $\frac{2}{3}$	1	4480	33.1	4,500	9.64	7.95	164	148	129	1.7	74	[1]500+	28.82
22	Idle	—	—	—	22,000	7.60	5.45	42	25	14	6.0	74	305	3.28

[1] over 500°F, out of range of pyrometer

CONSTANT - SPEED EMISSIONS TEST DATA HARLEY-DAVIDSON FLH Motorcycle

Date 10/6/71 Atmospheric Pressure 29.34 in Hg Wet Bulb Temp. 63 °F Dry Bulb Temp. 69 °F

RUN No. 4

			Engine	Dyno	FIA	NDIR			C.L.		Polar.	Temperatures, °F		Fuel Rate,
Mode	Condition	Gear	rpm	hp	HC, ppmC	CO, %	CO_2, %	NO, ppm	NO_x, ppm	NO, ppm	O_2, %	Inlet	Exhaust	lbm/hr
1	Idle	—	—	—	17,400	7.17	5.47	49	28	15	7.8	74	135	3.16
2	20 RL	1	2970	—	11,000	8.87	6.51	56	46	30	5.1	74	230	7.53
3	30 RL	2	2690	—	8,900	9.03	6.42	63	48	33	4.8	73	290	7.65
4	40 RL	3	2420	—	8,200	9.19	6.35	60	47	34	2.8	73	315	7.77
5	50 RL	4	2460	—	5,500	8.80	6.81	74	62	50	3.2	74	325	7.53
6	20 5%	1	2970	4.1	5,300	9.19	7.47	70	60	51	3.0	74	275	8.16
7	30 5%	2	2690	6.0	3,150	7.79	7.81	99	71	67	3.1	74	350	7.42
8	40 5%	3	2420	8.3	3,000	6.73	8.70	139	107	104	3.1	74	380	7.65
9	50 5%	4	2460	10.1	2,850	6.14	9.25	165	134	131	3.0	74	380	7.31
10	20 10%	1	2970	6.3	3,600	7.32	7.98	88	75	70	2.6	74	300	8.90
11	30 10%	2	2690	9.3	2,150	4.40	9.45	191	162	158	2.9	74	425	7.42
12	40 10%	3	2420	12.8	1,400	0.64	11.98	1248	1251	1251	2.7	74	435	7.90
13	50 10%	4	2460	15.7	2,700	6.57	8.33	209	185	185	2.9	74	450	10.88
14	20 20%	1	2970	10.7	2,700	3.84	10.87	232	269	269	2.4	74	325	8.59
15	30 20%	2	2690	15.9	2,500	5.70	9.44	202	259	259	2.5	74	490	11.66
16	0.6Max. RL	1	3360	—	8,000	9.03	6.65	63	47	36	3.2	74	400	8.03
17	0.6Max. $\frac{1}{3}$	1	3360	13.9	3,100	5.40	9.64	247	232	222	2.7	74	480	9.60
18	0.6Max. $\frac{2}{3}$	1	3360	25.8	3,500	8.09	8.33	180	195	185	2.1	75	[1]500+	19.60
19	0.8Max. RL	1	4480	—	2,700	6.42	8.70	110	79	74	2.1	75	[1]500+	9.60
20	0.8Max. $\frac{1}{3}$	1	4480	17.8	3,500	7.93	8.33	135	121	116	2.9	75	[1]500+	18.41
21	0.8Max. $\frac{2}{3}$	1	4480	33.1	3,600	9.98	7.64	121	107	102	1.8	75	[1]500+	32.66
22	Idle	—	—	—	20,400	8.25	5.76	63	29	18	5.6	75	320	3.33

[1] over 500°F, out of range of pyrometer

CONSTANT-SPEED EMISSIONS TEST DATA HONDA CL350 K3 Motorcycle

Date 10/13/71 Atmospheric Pressure 29.26 in Hg Wet Bulb Temp. 62 °F Dry Bulb Temp. 72 °F

RUN No. 7

			Engine	Dyno	FIA	NDIR			C. L.		Polar.	Temperatures, °F		Fuel Rate,
Mode	Condition	Gear	rpm	hp	HC, ppm C	CO, %	CO₂, %	NO, ppm	NOₓ, ppm	NO, ppm	O₂, %	Inlet	Exhaust	lbm/hr
1	Idle	—	1200	—	4,600	2.52	8.95	61	37	37	4.5	74	110	0.88
2	20 RL	2	3800	—	8,800	7.63	7.51	48	58	50	2.7	74	125	2.59
3	30 RL	3	4300	—	14,000	9.78	6.32	56	44	37	2.9	74	135	3.85
4	40 RL	4	4800	—	14,000	10.76	6.18	70	51	37	2.6	74	150	5.26
5	50 RL	5	5200	—	8,200	9.87	6.90	119	103	96	2.3	74	225	5.00
6	20 5%	2	3800	3.1	9,000	10.73	6.47	41	38	32	2.3	74	125	4.29
7	30 5%	3	4300	4.6	8,200	10.41	6.47	70	60	53	2.3	74	200	5.97
8	40 5%	4	4800	6.5	7,200	10.73	6.47	99	74	64	1.9	74	300	8.03
9	50 5%	5	5200	7.9	6,600	8.37	7.98	302	272	227	1.6	74	375	8.30
10	20 10%	2	3800	4.5	8,600	11.60	6.18	78	65	62	1.8	74	315	5.05
11	30 10%	3	4300	6.6	6,700	10.54	6.75	91	78	75	1.8	74	260	7.31
12	40 10%	4	4800	9.2	6,500	10.70	6.75	134	110	92	1.5	74	390	8.90
13	50 10%	5	5200	*11.0	7,200	11.56	6.47	142	120	101	1.5	74	485	10.65
14	20 20%	2	3800	7.1	7,400	11.39	6.47	170	101	101	1.9	74	380	7.10
15	30 20%	3	4300	*9.0	10,400	13.94	5.36	57	38	35	1.9	74	400	10.00
16	0.6 Max. RL	2	5700	—	28,000	10.00	5.76	99	46	35	4.7	74	150	5.26
17	0.6 Max. $\frac{1}{3}$	2	5700	7.4	10,000	9.14	7.98	325	317	317	2.7	74	375	7.77
18	0.6 Max. $\frac{2}{3}$	2	5700	12.1	6,000	5.75	9.64	—	1002	957	1.8	74	†500+	8.30
19	0.8 Max. RL	1	7600	—	16,000	11.45	6.04	70	60	51	2.4	74	490	6.71
20	0.8 Max. $\frac{1}{3}$	1	7600	9.6	8,400	8.18	8.29	503	425	407	2.6	74	335	9.42
21	0.8 Max. $\frac{2}{3}$	1	7600	16.7	6,800	9.12	8.14	424	389	326	1.9	74	†500+	12.89
22	Idle	—	1300	—	3,400	4.01	8.46	76	58	56	4.6	74	200	1.20

* Motorcycle would not pull calculated load, so maximum load consistent with smooth operation was recorded † over 500°F, out of range of pyrometer

CONSTANT-SPEED EMISSIONS TEST DATA HONDA CL350 K3 Motorcycle

Date 10/15/71 Atmospheric Pressure 29.08 in Hg Wet Bulb Temp. 64 °F Dry Bulb Temp. 73 °F

RUN No. 8

			Engine	Dyno	FIA	NDIR			C.L.		Polar.	Temperatures, °F		Fuel Rate,
Mode	Condition	Gear	rpm	hp	HC, ppm C	CO, %	CO_2, %	NO, ppm	NO_x, ppm	NO, ppm	O_2, %	Inlet	Exhaust	lbm/hr
1	Idle	——	1200	——	5,600	3.06	8.44	55	40	39	4.5	76	110	1.01
2	20 RL	2	3800	——	10,800	8.62	6.74	41	41	28	2.6	76	125	2.80
3	30 RL	3	4300	——	24,800	10.19	5.35	35	30	15	2.9	76	110	4.80
4	40 RL	4	4800	——	18,000	10.14	5.75	35	42	26	2.3	76	150	5.21
5	50 RL	5	5200	——	14,800	9.76	6.31	77	69	51	2.0	76	200	5.76
6	20 5%	2	3800	3.1	10,800	11.77	5.89	56	39	31	1.8	76	125	4.54
7	30 5%	3	4300	4.6	8,200	11.57	6.17	63	55	51	1.9	76	175	5.90
8	40 5%	4	4800	6.5	6,800	10.68	6.74	105	92	82	1.7	76	200	7.31
9	50 5%	5	5200	7.9	6,000	7.41	8.44	399	414	351	1.3	76	375	7.77
10	20 10%	2	3800	4.5	8,400	7.26	10.34	67	69	56	2.2	78	150	5.16
11	30 10%	3	4300	6.6	7,600	11.56	6.31	70	76	74	1.9	78	260	7.00
12	40 10%	4	4800	9.2	6,600	9.97	7.34	184	164	146	1.7	78	390	9.61
13	50 10%	5	5200	*11.0	6,000	9.16	7.49	325	318	291	1.5	78	460	10.65
14	20 20%	2	3800	7.1	10,200	10.69	6.59	70	61	58	2.0	78	200	10.00
15	30 20%	3	4300	*9.0	8,800	11.74	6.17	70	81	74	1.9	78	350	8.91
16	0.6Max. RL	2	5700	——	10,600	9.39	6.74	77	62	46	2.8	78	285	4.19
17	0.6Max. $\frac{1}{3}$	2	5700	7.4	7,400	8.46	8.44	322	270	270	1.8	78	275	7.31
18	0.6Max. $\frac{2}{3}$	2	5700	12.1	6,000	6.16	9.62	761	822	755	1.3	77	460	8.03
19	0.8Max. RL	1	7600	——	25,200	9.95	6.03	85	58	42	1.8	77	365	7.54
20	0.8Max. $\frac{1}{3}$	1	7600	9.6	9,400	8.83	7.80	169	163	147	1.6	77	285	11.14
21	0.8Max. $\frac{2}{3}$	1	7600	16.7	7,200	8.77	8.44	322	288	270	1.3	77	†500+	15.31
22	Idle	——	1200	——	3,600	2.77	9.45	54	52	49	3.5	77	250	0.92

* Motorcycle would not pull calculated load, so maximum load consistent with smooth operation was recorded † over 500°F, out of range of pyrometer

			ENGINE	DYNO	FIA HC,	NDIR				CL		O_2,	FUEL RATE	
MODE	CONDITION	GEAR	RPM	hp	ppmC	HC, ppmC_6	CO, %	CO_2, %	NO, ppm	NO, ppm	NO_x, ppm	%	lbm/hr	g/hr
1	IDLE	—	1100	—	18,600	300	9.03	6.74	17	24	31	—	0.355	161
2	20 RL	3	4400	—	9350	413	9.38	6.89	52	71	82	—	1.48	672
3	30 RL	4	5500	—	6300	314	5.76	9.23	180	219	228	—	1.74	791
4	40 RL	5	5600	—	5500	259	4.98	9.74	407	449	483	—	2.26	1030
5	50 RL	5	6900	—	6700	295	3.21	10.82	1070	1150	1180	—	3.38	1530
6	IDLE	—	1200	—	20,000	774	10.44	6.03	17	23	32	—	0.639	290
7	20 - 5%	3	4250	1.0	6100	363	4.45	10.05	617	679	722	—	1.94	879
8	30 - 5%	4	5500	2.0	5850	348	6.49	8.91	491	521	521	—	3.10	1410
9	40-3.0%*	5	5800	1.2	7300	406	7.79	8.02	308	344	344	—	3.71	1680
10	50-2.4%*	5	6900	1.2	6050	315	4.56	10.13	990	1060	1060	—	5.54	2510
11	IDLE	—	1200	—	16,800	479	10.17	6.39	12	26	32	—	0.692	314
12	20 H	2	6000	2.2	5300	291	5.15	9.79	575	591	599	—	2.66	1210
13	30 H	3	6600	2.5	5500	291	5.76	9.32	645	675	675	—	3.73	1690
14	40 H	4	7000	2.1	5580	282	4.12	10.34	938	1020	1020	—	4.01	1820
15	IDLE	—	1200	—	12,600	439	9.90	6.68	46	32	39	—	0.719	326

*about 75% of power available over road load

HONDA SL-100 MOTORCYCLE CONSTANT-SPEED EMISSIONS TEST DATA

RUN 3
DATE 8/30/72

WET BULB TEMPERATURE, °F 69
DRY BULB TEMPERATURE, °F 80
ATMOSPHERIC PRESSURE, in Hg 29.10

						NDIR				CL				
			ENGINE	DYNO	FIA HC,	HC,	CO,	CO_2,	NO,	NO,	NO_x,	O_2,	FUEL RATE	
MODE	CONDITION	GEAR	RPM	hp	ppmC	ppmC$_6$	%	%	ppm	ppm	ppm	%	lbm/hr	g/hr
1	IDLE	—	1200	—	24,400	848	9.49	6.36	58	22	34	—	0.719	326
2	20 RL	3	4300	—	8850	432	7.60	7.70	117	112	116	—	1.44	652
3	30 RL	4	5400	—	6480	292	4.57	9.75	284	284	288	—	1.78	809
4	40 RL	5	5600	—	6020	293	4.57	9.75	473	492	496	—	2.20	997
5	50 RL	5	6800	—	7100	330	2.66	10.85	1250	1260	1270	—	2.82	1280
6	IDLE	—	1200	—	18,300	648	10.18	6.26	40	27	36	—	0.701	318
7	20-5%	3	4300	1.0	6970	411	5.25	9.18	495	509	522	—	2.07	941
8	30-5%	4	5200	2.0	5920	351	5.24	9.35	753	690	690	—	3.10	1410
9	40-3.0%*	5	5500	1.2	5800	339	5.43	9.17	761	868	868	—	3.43	1560
10	50-2.4%*	5	6800	1.2	5910	294	3.92	10.08	1230	1740	1740	—	3.86	1750
11	IDLE	—	1200	—	11,800	428	9.44	6.70	40	38	47	—	0.736	334
12	20 H	2	5800	2.2	5250	304	5.37	9.17	436	449	500	—	2.64	1200
13	30 H	3	6400	2.5	5810	270	5.43	9.08	728	796	796	—	3.79	1720
14	40 H	4	7000	2.1	6200	272	3.88	10.00	1132	1220	1220	—	3.87	1760
15	IDLE	—	1200	—	10,600	404	9.44	6.70	40	38	43	—	0.602	273

*about 75% of power available over road load

HONDA SL-100 MOTORCYCLE CONSTANT-SPEED EMISSIONS TEST DATA

RUN 4

DATE 8/31/72

WET BULB TEMPERATURE, °F 68

DRY BULB TEMPERATURE, °F 76

ATMOSPHERIC PRESSURE, in Hg 29.13

			ENGINE	DYNO		NDIR				CL			FUEL RATE	
MODE	CONDITION	GEAR	RPM	hp	FIA HC, ppmC	HC, ppm C_6	CO, %	CO_2, %	NO, ppm	NO, ppm	NO_x, ppm	O_2, %	lbm/hr	g/hr
1	IDLE	—	1200	—	16,600	537	9.39	6.68	40	29	38	—	0.639	290
2	20 RL	3	4300	—	9000	408	8.23	7.48	105	100	105	—	1.49	676
3	30 RL	4	5400	—	7280	327	6.16	8.81	218	220	224	—	1.90	862
4	40 RL	5	5600	—	5900	272	4.71	9.80	542	511	515	—	2.45	1110
5	50 RL	5	6800	—	6800	274	2.92	10.78	1350	1320	1330	—	2.99	1360
6	IDLE	—	1200	—	13,400	431	9.16	6.98	40	38	45	—	0.626	284
7	20 - 5%	3	4300	1.0	6150	317	4.72	9.61	826	810	815	—	2.23	1010
8	30 - 5%	4	5300	2.0	5900	282	5.67	9.02	571	595	595	—	3.05	1380
9	40 - 3.0%*	5	5500	1.2	6500	316	5.80	9.01	730	743	764	—	3.55	1610
10	50 - 2.4%*	5	6800	1.2	6100	272	4.48	9.82	1100	1240	1240	—	4.21	1910
11	IDLE	—	1200	—	10,400	346	9.26	6.90	40	38	46	—	0.602	273
12	20 H	2	5700	2.2	5250	272	4.78	9.61	644	631	640	—	2.75	1250
13	30 H	3	6400	2.5	5800	250	5.68	8.77	659	703	703	—	3.90	1770
14	40 H	4	7000	2.1	6300	251	4.11	9.85	1100	1180	1180	—	3.98	1800
15	IDLE	—	1200	—	10,900	457	9.50	6.75	40	39	46	—	0.613	278

*about 75% of power available over road load

HONDA SL-100 MOTORCYCLE CONSTANT-SPEED EMISSIONS TEST DATA

RUN 5
DATE 8/31/72

WET BULB TEMPERATURE, °F 62
DRY BULB TEMPERATURE, °F 71
ATMOSPHERIC PRESSURE, in Hg 29.07

MODE	CONDITION	GEAR	ENGINE RPM	DYNO hp	FIA HC, ppmC	NDIR				CL		O_2, %	FUEL RATE	
						HC, ppmC_6	CO, %	CO_2, %	NO, ppm	NO, ppm	NO_x, ppm		lbm/hr	g/hr
1	IDLE	—	1200	—	15,100	566	9.27	6.45	81	24	36	—	0.553	251
2	20 RL	3	4100	—	9200	395	8.61	6.91	99	91	97	—	1.51	685
3	30 RL	4	5100	—	7000	281	5.58	9.17	324	288	292	—	1.96	890
4	40 RL	5	5400	—	5600	248	5.24	9.37	488	500	500	—	2.68	1210
5	50 RL	5	6500	—	7400	285	2.87	10.66	1540	1540	1540	—	3.17	1440
6	IDLE	—	1100	—	14,700	591	9.59	6.57	28	30	40	—	0.545	247
7	20 - 5%	3	4100	1.0	6800	365	5.41	8.69	490	512	520	—	1.99	902
8	30 - 5%	4	5100	2.0	5800	328	5.06	9.39	790	807	807	—	3.21	1460
9	40-3.0%*	5	5300	1.2	5400	248	5.12	9.46	805	869	869	—	3.17	1440
10	50-2.4%*	5	6500	1.2	5800	261	4.04	10.09	1240	1170	1180	—	3.80	1720
11	IDLE	—	1100	—	11,100	548	9.46	6.64	28	38	41	—	0.536	243
12	20 H	2	5700	2.2	4950	299	4.32	8.29	830	823	823	—	2.78	1260
13	30 H	3	6100	2.5	5350	126	5.05	9.55	901	890	901	—	3.84	1740
14	40 H	4	6800	2.1	6500	238	4.99	9.65	973	1020	1020	—	4.09	1860
15	IDLE	—	1200	—	11,800	507	9.68	6.78	12	33	40	—	0.545	247

*about 75% of power available over road load

HONDA SL-100 MOTORCYCLE CONSTANT-SPEED EMISSIONS TEST DATA

RUN 6
DATE 9/5/72

WET BULB TEMPERATURE, °F 66
DRY BULB TEMPERATURE, °F 74
ATMOSPHERIC PRESSURE, in Hg 29.16

						NDIR				CL				
MODE	CONDITION	GEAR	ENGINE RPM	DYNO hp	FIA HC, ppmC	HC, ppmC$_6$	CO, %	CO$_2$, %	NO, ppm	NO, ppm	NO$_x$, ppm	O$_2$, %	FUEL RATE lbm/hr	FUEL RATE g/hr
1	IDLE	—	1100	—	14,600	467	9.10	7.01	57	28	38	—	0.507	230
2	20 RL	3	4200	—	8400	436	6.61	8.19	155	133	140	—	1.59	722
3	30 RL	4	5200	—	6150	362	4.62	9.93	436	390	394	—	2.00	905
4	40 RL	5	5400	—	5100	281	4.51	10.04	745	695	700	—	2.63	1190
5	50 RL	5	6500	—	5950	261	2.98	11.00	1510	1540	1540	—	3.38	1530
6	IDLE	—	1100	—	11,200	635	8.99	7.17	69	42	49	—	0.516	230
7	20-5%	3	4100	1.0	4850	412	4.02	10.35	1000	1060	1060	—	2.05	928
8	30-5%	4	5100	2.0	5100	303	5.04	9.81	951	845	856	—	3.27	1480
9	40-30%*	5	5300	1.2	5560	292	4.92	9.74	1010	995	995	—	3.17	1440
10	50-24%*	5	6500	1.2	5920	270	4.50	10.12	1050	1060	1060	—	3.99	1810
11	IDLE	—	1100	—	11,000	650	9.22	6.94	69	42	50	—	0.525	238
12	20 H	2	5600	2.2	5300	351	4.74	9.93	632	635	643	—	2.78	1260
13	30 H	3	6100	2.5	5400	316	4.94	9.77	1060	1060	1060	—	3.84	1740
14	40 H	4	6700	2.1	6200	333	4.04	9.85	955	936	957	—	3.87	1760
15	IDLE	—	1100	—	11,100	521	9.34	6.86	63	39	44	—	0.516	234

*about 75% of power available over road load

HONDA SL-100 MOTORCYCLE CONSTANT-SPEED EMISSIONS TEST DATA

RUN 7
DATE 9/5/72

WET BULB TEMPERATURE, °F 69
DRY BULB TEMPERATURE, °F 77
ATMOSPHERIC PRESSURE, in Hg 29.09

			ENGINE	DYNO	FIA HC,	NDIR				CL		O$_2$,	FUEL RATE	
MODE	CONDITION	GEAR	RPM	hp	ppm C	HC, ppm C$_6$	CO, %	CO$_2$, %	NO, ppm	NO, ppm	NO$_x$, ppm	%	lbm/hr	g/hr
1	IDLE	—	1200	—	14,600	576	8.88	7.33	57	27	37	—	0.492	223
2	20 RL	3	4100	—	8500	508	8.26	7.75	117	90	96	—	1.59	722
3	30 RL	4	5100	—	6300	164	4.54	10.58	371	379	383	—	1.90	862
4	40 RL	5	5300	—	5200	270	4.01	10.73	662	635	639	—	2.83	1280
5	50 RL	5	6500	—	5600	249	2.37	11.87	1680	1700	1710	—	3.49	1580
6	IDLE	—	1200	—	12,500	336	8.31	7.23	58	39	47	—	0.492	223
7	20 - 5%	3	4200	1.0	5300	280	4.26	10.70	933	918	939	—	2.73	1240
8	30 - 5%	4	5000	2.0	5200	269	4.78	10.28	1020	1010	1020	—	3.27	1480
9	40 - 3.0%*	5	5300	1.2	5200	248	4.23	10.34	1070	1100	1100	—	3.22	1460
10	50 - 2.4%*	5	6400	1.2	5300	258	5.29	9.71	933	886	897	—	4.13	1880
11	IDLE	—	1100	—	11,100	416	9.44	6.93	57	37	46	—	0.525	238
12	20 H	2	5500	2.2	4600	248	4.22	10.60	863	824	824	—	2.75	1250
13	30 H	3	6100	2.5	5100	259	4.56	10.13	1190	1190	1200	—	3.73	1690
14	40 H	4	6700	2.1	6300	315	4.80	9.92	1050	994	1000	—	4.39	1990
15	IDLE	—	1100	—	12,440	589	9.43	7.00	57	36	44	—	0.492	223

*about 75% of power available over road load

HONDA SL-100 MOTORCYCLE CONSTANT-SPEED EMISSIONS TEST DATA

RUN 8
DATE 9/6/72

WET BULB TEMPERATURE, °F 68
DRY BULB TEMPERATURE, °F 77
ATMOSPHERIC PRESSURE, in Hg 29.06

						NDIR				CL				
MODE	CONDITION	GEAR	ENGINE RPM	DYNO hp	FIA HC, ppmC	HC, ppmC$_6$	CO, %	CO$_2$, %	NO, ppm	NO, ppm	NO$_x$, ppm	O$_2$, %	FUEL RATE lbm/hr	FUEL RATE g/hr
1	IDLE	—	1100	—	14,600	432	8.82	7.21	58	29	36	—	0.578	262
2	20 RL	3	4300	—	8150	384	7.09	8.40	161	143	152	—	1.55	703
3	30 RL	4	5100	—	6000	271	4.25	10.37	572	553	570	—	2.07	937
4	40 RL	5	5300	—	5050	228	4.25	10.37	886	851	862	—	2.83	1280
5	50 RL	5	6500	—	5900	262	2.91	11.06	1620	1670	1680	—	3.55	1610
6	IDLE	—	1100	—	12,400	418	9.14	7.04	58	37	46	—	0.461	209
7	20- 5%	3	4000	1.0	5850	316	4.70	9.97	764	829	850	—	2.10	954
8	30 - 5%	4	5100	2.0	5500	270	4.93	9.86	956	976	987	—	3.46	1570
9	40 - 3.0%*	5	5300	1.2	5000	239	4.25	10.19	1320	1360	1360	—	3.27	1480
10	50-2.4%*	5	6500	1.2	6350	146	5.78	9.17	778	847	847	—	4.62	2100
11	IDLE	—	1200	—	11,000	539	9.56	7.09	46	39	48	—	0.545	247
12	20 H	2	5600	2.2	5050	271	4.36	10.18	723	851	862	—	2.75	1250
13	30 H	3	6100	2.5	5520	196	5.38	9.64	865	900	910	—	3.73	1690
14	40 H	4	6700	2.1	6800	249	5.19	9.66	849	849	860	—	4.39	1990
15	IDLE	—	1100	—	12,200	535	9.35	7.02	57	38	47	—	0.536	243

*about 75% of power available over road load

HONDA SL-100 MOTORCYCLE CONSTANT-SPEED EMISSIONS TEST DATA

RUN 9
DATE 9/6/72

WET BULB TEMPERATURE, °F 65
DRY BULB TEMPERATURE, °F 76
ATMOSPHERIC PRESSURE, in Hg 29.00

						NDIR				CL				
			ENGINE	DYNO	FIA HC,	HC,	CO,	CO₂,	NO,	NO,	NOx,	O₂,	FUEL RATE	
MODE	CONDITION	GEAR	RPM	hp	ppm C	ppm C_6	%	%	ppm	ppm	ppm	%	lbm/hr	g/hr
1	IDLE	—	1100	—	12,600	468	9.01	6.73	58	21	37	—	0.507	230
2	20 RL	3	4100	—	7800	419	7.88	7.53	123	100	105	—	1.53	694
3	30 RL	4	5100	—	5350	293	4.13	10.05	352	306	310	—	1.90	862
4	40 RL	5	5300	—	4650	259	4.56	9.93	616	550	555	—	2.58	1170
5	50 RL	5	6300	—	5300	273	2.43	11.06	1600	1520	1520	—	3.27	1480
6	IDLE	—	1100	—	12,200	480	9.21	6.86	75	35	44	—	0.483	219
7	20 - 5%	3	4000	1.0	4950	327	4.51	9.75	889	822	831	—	2.10	954
8	30 - 5%	4	5000	2.0	4800	292	4.80	9.64	943	889	900	—	3.21	1460
9	40 - 3.0%*	5	5200	1.2	4420	270	4.80	9.74	881	847	858	—	3.17	1440
10	50 - 2.4%*	5	6300	1.2	6000	338	6.29	8.60	792	675	696	—	4.53	2060
11	IDLE	—	1100	—	10,400	548	9.22	6.79	69	37	45	—	0.439	199
12	20 H	2	5400	2.2	4300	315	4.57	9.75	779	646	678	—	2.68	1210
13	30 H	3	6100	2.5	4950	291	5.77	8.79	845	739	760	—	3.90	1770
14	40 H	4	6700	2.1	6600	327	5.44	9.08	770	678	689	—	4.27	1940
15	IDLE	—	1100	—	11,800	520	9.44	6.70	57	33	40	—	0.467	212

*about 75% of power available over road load

HONDA SL-100 MOTORCYCLE CONSTANT-SPEED EMISSIONS TEST DATA

RUN 10
DATE 9/7/72

WET BULB TEMPERATURE, °F 70
DRY BULB TEMPERATURE, °F 77
ATMOSPHERIC PRESSURE, in Hg 29.10

			ENGINE	DYNO	FIA HC,	NDIR				CL		O₂,	FUEL RATE	
MODE	CONDITION	GEAR	RPM	hp	ppm C	HC, ppm C_6	CO, %	CO_2, %	NO, ppm	NO, ppm	NO_x, ppm	%	lbm/hr	g/hr
1	IDLE	—	2000	—	77,100	8730	3.46	3.84	64	4.7	7.5	9.7	0.452	205
2	20 RL	3	4500	—	32,700	4210	0.79	9.36	31	23	26	5.4	1.52	691
3	30 RL	4	6400	—	26,800	2920	1.31	9.93	68	52	58	4.0	2.00	905
4	40 RL	5	6500	—	39,200	3570	3.44	7.80	70	54	60	5.1	3.21	1460
5	50 RL	5	6100	—	52,000	6140	1.74	8.99	542	—	—	6.8	5.64	2560
6	IDLE	—	2000	—	82,900	10,800	4.00	3.65	100	9.0	24	10.3	0.452	205
7	20-5%	3	4500	1.1	44,200	6380	1.79	7.86	448	—	—	6.3	3.13	1420
8	20 H	2	6000	3.5	63,200	6400	2.52	6.75	471	—	—	7.7	5.89	2670
9	30 H	3	6500	3.3	70,400	7290	3.14	5.69	311	234	255	8.4	7.82	3540
10	40 H	4	6500	2.2	73,600	9110	3.88	5.17	220	108	162	8.3	9.04	4100
11	IDLE	—	2000	—	82,100	11,100	3.99	3.57	100	5.5	13	10.1	0.445	202
12														
13														
14														
15														

KAWASAKI 125F-6 MOTORCYCLE CONSTANT-SPEED EMISSIONS TEST DATA

RUN 1
DATE 9/19/72

WET BULB TEMPERATURE, °F 69
DRY BULB TEMPERATURE, °F 79
ATMOSPHERIC PRESSURE, in Hg 29.21

						NDIR				CL				
			ENGINE	DYNO	FIA HC,	HC,	CO,	CO_2,	NO,	NO,	NO_x,	O_2,	FUEL RATE	
MODE	CONDITION	GEAR	RPM	hp	ppmC	ppmC$_6$	%	%	ppm	ppm	ppm	%	lbm/hr	g/hr
1	IDLE	—	2000	—	72,200	—	3.63	3.79	68	2.4	5.9	10.5	0.439	199
2	20 RL	3	4500	—	31,300	—	0.53	9.41	80	27	33	5.2	1.50	679
3	30 RL	4	5000	—	26,400	—	1.43	9.54	101	45	50	4.1	1.90	862
4	40 RL	5	5100	—	33,800	—	3.00	8.30	109	105	118	4.5	2.99	1360
5	50 RL	5	6100	—	43,800	—	1.53	7.58	399	278	296	6.6	4.82	2190
6	IDLE	—	2000	—	81,000	—	4.06	3.57	95	3.6	10	10.2	0.445	202
7	20- 5%	3	4500	1.1	48,400	—	2.08	7.44	607	491	527	6.4	3.13	1420
8	20 H	2	6100	3.5	61,000	—	2.71	6.16	526	440	467	7.5	6.01	2730
9	30 H	3	6500	3.3	64,200	—	3.31	5.75	314	231	257	7.8	8.66	3930
10	40 H	4	6500	2.2	69,000	—	3.75	5.40	224	119	141	7.9	9.46	4290
11	IDLE	—	2000	—	83,000	—	4.08	3.66	114	4.4	10	9.7	0.461	209
12														
13														
14														
15														

KAWASAKI 125F-6 MOTORCYCLE CONSTANT-SPEED EMISSIONS TEST DATA

RUN 2
DATE 9/19/72

WET BULB TEMPERATURE, °F 69
DRY BULB TEMPERATURE, °F 79
ATMOSPHERIC PRESSURE, in Hg 29.34

						NDIR				CL				
MODE	CONDITION	GEAR	ENGINE	DYNO	FIA HC,	HC,	CO,	CO_2,	NO,	NO,	NO_x,	O_2,	FUEL RATE	
			RPM	hp	ppmC	ppmC_6	%	%	ppm	ppm	ppm	%	lbm/hr	g/hr
1	IDLE	—	2000	—	75,800	8560	3.63	3.71	59	2.7	8.9	11.1	0.439	199
2	20 RL	3	4500	—	30,300	5090	0.40	9.35	76	25	30	5.6	1.42	646
3	30 RL	4	5100	—	24,800	3280	1.52	9.55	93	40	47	4.2	1.84	835
4	40 RL	5	5200	—	31,400	3000	2.42	8.59	137	79	81	4.7	2.72	1230
5	50 RL	5	6200	—	47,200	4510	1.73	7.88	555	447	461	6.9	4.73	2150
6	IDLE	—	2000	—	84,200	7720	4.13	3.69	105	5.1	13	10.7	0.452	205
7	20 - 5%	3	4400	1.1	47,800	6510	2.62	7.20	442	384	402	6.6	3.68	1670
8	20 H	2	6300	3.5	48,800	6200	2.63	6.60	530	404	418	8.9	6.01	2730
9	30 H	3	6500	3.3	69,300	7250	3.92	5.25	225	126	159	8.4	9.01	4090
10	40 H	4	6700	2.2	63,800	6440	3.26	7.54	270	228	260	8.1	7.79	3540
11	IDLE	—	2000	—	77,600	8670	3.91	3.85	96	5.0	12	10.6	0.452	205
12														
13														
14														
15														

KAWASAKI 125F-6 MOTORCYCLE CONSTANT-SPEED EMISSIONS TEST DATA

RUN 3
DATE 9/19/72

WET BULB TEMPERATURE, °F 66
DRY BULB TEMPERATURE, °F 76
ATMOSPHERIC PRESSURE, in Hg 29.33

						NDIR				CL			FUEL RATE	
MODE	CONDITION	GEAR	ENGINE RPM	DYNO hp	FIA HC, ppmC	HC, ppmC_6	CO, %	CO_2, %	NO, ppm	NO, ppm	NO_x, ppm	O_2, %	lbm/hr	g/hr
1	IDLE	—	2000	—	84,100	7890	3.25	4.26	64	4.1	7.8	10.7	0.410	186
2	20 RL	3	4500	—	35,400	4310	0.43	9.67	62	30	34	5.5	1.50	679
3	30 RL	4	5200	—	30,700	3070	1.60	9.51	66	48	51	4.3	2.10	954
4	40 RL	5	5200	—	40,000	3920	3.18	7.90	141	124	132	5.2	3.33	1510
5	50 RL	5	6200	—	60,300	4940	2.72	7.02	354	315	347	7.2	5.64	2560
6	IDLE	—	2000	—	87,000	9140	4.00	3.82	59	6.4	16	10.3	0.439	199
7	20 - 5%	3	4500	1.1	53,500	5240	1.54	7.69	706	612	632	7.3	3.21	1460
8	20 H	2	6100	3.5	59,900	5970	1.61	7.34	840	722	731	7.8	5.31	2410
9	30 H	3	6500	3.3	69,200	7240	2.82	6.13	456	370	397	8.5	7.60	3450
10	40 H	4	6200	2.2	74,300	8670	3.07	5.90	474	361	384	8.8	8.15	3700
11	IDLE	—	2000	—	81,100	10,100	3.87	5.20	113	6.4	19	10.2	0.439	199
12														
13														
14														
15														

KAWASAKI 125F-6 MOTORCYCLE CONSTANT-SPEED EMISSIONS TEST DATA

RUN 4
DATE 9/20/72

WET BULB TEMPERATURE, °F 64
DRY BULB TEMPERATURE, °F 75
ATMOSPHERIC PRESSURE, in Hg 29.27

			ENGINE	DYNO	FIA HC,	NDIR				CL		O_2,	FUEL RATE	
MODE	CONDITION	GEAR	RPM	hp	ppmC	HC, ppmC$_6$	CO, %	CO_2, %	NO, ppm	NO, ppm	NO_x, ppm	%	lbm/hr	g/hr
1	IDLE	—	2000	—	76,800	9820	2.81	4.53	95	5.0	10	11.5	0.421	191
2	20 RL	3	4500	—	38,400	6420	1.64	9.54	92	30	38	5.8	1.67	756
3	30 RL	4	5000	—	32,800	4280	1.73	9.71	129	70	81	4.4	2.22	1010
4	40 RL	5	5000	—	43,200	4960	0.93	9.15	300	240	290	6.2	3.33	1510
5	50 RL	5	6200	—	63,200	7070	2.16	7.08	572	548	584	8.0	5.89	2670
6	IDLE	—	4400	—	97,600	11,900	4.08	3.93	101	8.6	18	10.6	0.428	194
7	20 - 5%	3	2100	1.1	55,200	7200	2.37	7.68	715	491	602	7.0	3.27	1480
8	20 H	2	6000	3.5	56,800	4760	1.48	7.75	638	720	792	7.6	4.63	2100
9	30 H	3	6100	3.3	72,400	9430	2.46	5.93	562	363	443	9.2	7.60	3450
10	40 H	4	6200	3.2	72,000	11,800	2.81	6.18	450	350	384	8.9	7.57	3430
11	IDLE	—	2000	—	99,200	16,300	4.19	4.04	127	6.8	22	10.5	0.439	199
12														
13														
14														
15														

KAWASAKI 125F-6 MOTORCYCLE CONSTANT-SPEED EMISSIONS TEST DATA

RUN 6
DATE 9/25/72

WET BULB TEMPERATURE, °F 64
DRY BULB TEMPERATURE, °F 73
ATMOSPHERIC PRESSURE, in Hg 29.04

CONSTANT - SPEED EMISSIONS TEST DATA SUZUKI T250 Motorcycle

Date 9/28/71 Atmospheric Pressure 29.18 in Hg Wet Bulb Temp. 63 °F Dry Bulb Temp. 70 °F

RUN No. 1

			Engine	Dyno	FIA	NDIR			C.L.		Polar.	Temperatures, °F		Fuel Rate,
Mode	Condition	Gear	rpm	hp	HC, ppmC	CO, %	CO_2, %	NO, ppm	NO_x, ppm	NO, ppm	O_2, %	Inlet	Exhaust	lbm/hr
1	Idle	—	1400	—	75,200	1.83	5.45	78	6	4	9.9	78	90	0.81
2	20 RL	2	3800	—	54,400	1.59	7.56	31	15	9	7.2	78	123	2.27
3	30 RL	3	4400	—	48,000	2.86	7.72	61	24	14	5.5	78	126	3.50
4	40 RL	4	4600	—	44,800	4.36	6.97	83	29	17	4.8	78	140	4.01
5	50 RL	5	5000	—	42,400	5.34	6.68	73	29	19	4.3	79	180	4.94
6	20 5%	2	3800	3.1	41,600	2.20	6.54	56	30	21	5.5	79	125	2.67
7	30 5%	3	4400	4.6	42,400	4.45	7.12	72	31	22	5.1	79	148	3.95
8	40 5%	4	4600	6.4	44,800	5.48	6.13	98	33	25	5.0	79	198	6.04
9	50 5%	5	5000	7.8	50,400	6.43	5.32	114	23	15	5.2	79	245	7.10
10	20 10%	2	3800	4.4	49,600	3.48	6.97	72	36	30	5.9	80	140	3.98
11	30 10%	3	4400	6.5	52,800	5.31	5.85	52	36	28	5.9	80	200	6.62
12	40 10%	4	4600	9.0	61,600	5.76	4.93	86	28	23	6.9	80	275	9.80
13	50 10%	5	5000	11.0	60,000	5.87	4.93	125	33	28	6.7	80	315	10.65
14	20 20%	2	3800	6.9	57,600	5.03	5.45	85	28	18	7.1	80	165	6.53
15	30 20%	3	4400	*8.5	61,600	6.19	4.55	28	21	11	7.2	80	260.	10.00
16	0.6Max. RL	2	5400	—	41,600	3.56	7.42	83	21	15	4.9	80	185	2.70
17	0.6Max. $\frac{1}{3}$	2	5400	8.6	49,600	6.63	5.18	85	24	13	4.7	79	225	10.42
18	0.6Max. $\frac{2}{3}$	2	5400	*12.0	72,000	5.43	4.06	86	20	10	7.8	79	290	18.14
19	0.8Max. RL	1	7200	—	29,600	2.99	8.97	81	22	14	4.8	79	240	3.00
20	0.8Max. $\frac{1}{3}$	1	7200	11.1	45,600	5.78	4.67	57	27	10	7.5	79	200	14.00
21	0.8Max. $\frac{2}{3}$	1	7200	*15.5	66,400	4.13	3.82	108	48	33	10.8	81	†500+	20.41
22	Idle	—	1400	—	68,000	2.67	4.42	86	7	4	11.7	81	250	—

* Motorcycle would not pull calculated load, so maximum load consistent with smooth operation was recorded. † over 500°F, out of range of pyrometer

CONSTANT - SPEED EMISSIONS TEST DATA SUZUKI T250 Motorcycle

Date 9/29/71 Atmospheric Pressure 29.21 in Hg Wet Bulb Temp. 66 °F Dry Bulb Temp. 73 °F

RUN No. 2

Mode	Condition	Gear	Engine rpm	Dyno hp	FIA	NDIR			C.L.		Polar.	Temperatures, °F		Fuel Rate,
					HC, ppmC	CO, %	CO_2, %	NO, ppm	NO_x, ppm	NO, ppm	O_2, %	Inlet	Exhaust	lbm/hr
1	Idle	—	1400	—	72,800	2.03	5.44	66	6	5	9.6	78	85	0.71
2	20 RL	2	3800	—	52,800	1.97	7.55	72	18	12	6.5	78	85	2.33
3	30 RL	3	4400	—	45,600	3.14	7.77	88	28	19	4.9	78	95	2.93
4	40 RL	4	4600	—	41,600	4.13	7.33	96	33	24	4.3	78	115	4.29
5	50 RL	5	5000	—	40,800	4.81	7.25	58	30	21	4.0	78	165	7.00
6	20 5%	2	3800	3.1	41,600	2.14	8.48	74	29	23	5.2	78	165	3.00
7	30 5%	3	4400	4.6	40,000	3.72	7.70	106	38	28	4.5	78	155	3.92
8	40 5%	4	4600	6.4	44,800	4.94	6.67	73	40	31	4.7	78	190	5.83
9	50 5%	5	5000	7.8	49,600	6.11	5.44	70	29	19	4.5	78	200	7.90
10	20 10%	2	3800	4.4	47,600	3.28	6.82	90	43	32	5.8	78	200	3.57
11	30 10%	3	4400	6.5	52,000	5.22	5.57	102	42	30	5.4	78	200	7.10
12	40 10%	4	4600	9.0	62,400	5.44	5.05	128	34	27	6.1	78	295	10.00
13	50 10%	5	5000	11.0	59,200	5.73	5.17	99	36	29	5.7	78	210	10.88
14	20 20%	2	3800	* 6.0	64,800	4.74	5.17	114	37	23	6.9	77	250	7.58
15	30 20%	3	4400	* 8.0	64,800	5.97	4.66	103	27	15	6.2	77	270	9.60
16	0.6 Max. RL	2	5400	—	43,200	3.64	7.25	111	22	16	4.7	77	215	2.80
17	0.6 Max. $\frac{1}{3}$	2	5400	8.6	61,600	5.16	4.92	85	28	18	6.5	77	145	10.88
18	0.6 Max. $\frac{2}{3}$	2	5400	* 12.0	75,200	6.63	3.81	71	19	8	7.3	77	350	20.41
19	0.8 Max. RL	1	7200	—	31,200	3.22	8.01	110	20	16	4.9	77	320	2.11
20	0.8 Max. $\frac{1}{3}$	1	7200	11.1	47,200	6.88	5.05	56	28	12	4.3	77	185	12.25
21	0.8 Max. $\frac{2}{3}$	1	7200	* 18.0	71,200	5.09	4.29	115	58	35	7.9	77	195	27.22
22	Idle	—	1400	—	75,200	2.75	5.05	114	7	6	9.5	77	160	0.71

* Motorcycle would not pull calculated load, so maximum load consistent with smooth operation was recorded.

CONSTANT - SPEED EMISSIONS TEST DATA SUZUKI T250 Motorcycle

Date 9/29/71 Atmospheric Pressure 29.19 in Hg Wet Bulb Temp. 64 °F Dry Bulb Temp. 72 °F

RUN No. 3

			Engine	Dyno	FIA	NDIR			C.L.		Polar.	Temperatures, °F		Fuel Rate,
Mode	Condition	Gear	rpm	hp	HC, ppm C	CO, %	CO_2, %	NO, ppm	NO_x, ppm	NO, ppm	O_2, %	Inlet	Exhaust	lbm/hr
1	Idle	—	1400	—	75,200	2.34	5.18	74	7	6	10.7	77	90	0.71
2	20 RL	2	3800	—	52,800	1.87	7.79	75	17	13	6.7	77	115	2.37
3	30 RL	3	4400	—	43,200	2.75	8.02	95	29	21	5.4	77	125	2.25
4	40 RL	4	4600	—	39,200	3.43	7.87	61	36	29	4.8	77	155	3.88
5	50 RL	5	5000	—	36,000	2.55	8.17	95	40	36	5.3	77	130	6.80
6	20 5%	2	3800	3.1	44,000	2.66	7.71	82	32	23	5.6	77	160	2.95
7	30 5%	3	4400	4.6	42,400	4.34	7.12	93	34	24	4.8	77	160	4.01
8	40 5%	4	4600	6.4	49,600	5.51	5.78	102	37	27	5.4	77	210	5.97
9	50 5%	5	5000	7.8	49,600	5.70	5.71	41	24	17	4.8	77	140	7.90
10	20 10%	2	3800	4.4	48,000	2.68	7.27	61	35	28	6.0	77	185	3.57
11	30 10%	3	4400	6.5	52,000	5.01	5.71	70	36	26	5.6	77	205	6.62
12	40 10%	4	4600	9.0	62,400	5.54	5.32	81	27	17	6.7	77	255	9.60
13	50 10%	5	5000	11.0	62,400	5.24	5.32	56	35	25	6.4	77	225	10.65
14	20 20%	2	3800	6.9	64,600	4.75	5.18	88	31	19	7.2	77	240	7.53
15	30 20%	3	4400	*8.5	68,000	6.00	4.42	86	18	9	7.0	77	260	10.00
16	0.6Max. RL	2	5400	—	44,000	3.37	7.12	104	31	14	5.4	77	225	2.67
17	0.6Max. $\frac{1}{3}$	2	5400	8.6	48,800	6.43	5.32	42	23	11	4.8	77	125	10.42
18	0.6Max. $\frac{2}{3}$	2	5400	*12.0	73,600	6.38	3.93	48	18	8	7.1	77	375	18.84
19	0.8Max. RL	1	7200	—	34,400	3.24	7.87	89	21	18	4.3	77	320	2.12
20	0.8Max. $\frac{1}{3}$	1	7200	11.1	45,600	6.93	5.18	21	30	10	4.5	77	175	12.56
21	0.8Max. $\frac{2}{3}$	1	7200	19.1	56,800	5.45	5.06	92	59	55	7.0	77	440	22.27
22	Idle	—	1400	—	77,600	2.96	5.06	92	11	6	9.6	77	260	0.78

* Motorcycle would not pull calculated load, so maximum load consistent with smooth operation was recorded.

CONSTANT - SPEED EMISSIONS TEST DATA SUZUKI T250 Motorcycle

Date 9/30/71 Atmospheric Pressure 29.20 in Hg Wet Bulb Temp. 63 °F Dry Bulb Temp. 73 °F

RUN No. 4

			Engine	Dyno	FIA	NDIR			C.L.		Polar.	Temperatures, °F		Fuel Rate,
Mode	Condition	Gear	rpm	hp	HC, ppmC	CO, %	CO_2, %	NO, ppm	NO_x, ppm	NO, ppm	O_2, %	Inlet	Exhaust	lb/hr
1	Idle	—	1400	—	77,600	2.34	5.32	74	9	6	9.3	78	90	0.69
2	20 RL	2	3800	—	52,800	1.97	7.73	65	19	12	5.8	78	115	2.33
3	30 RL	3	4400	—	43,200	3.26	7.57	85	29	17	4.9	78	130	3.02
4	40 RL	4	4600	—	41,600	4.46	6.98	83	33	19	4.4	77	145	4.08
5	50 RL	5	5000	—	44,800	5.28	6.41	48	27	16	4.4	77	165	7.65
6	20 5%	2	3800	3.1	44,000	2.77	7.57	68	29	21	5.8	77	150	2.80
7	30 5%	3	4400	4.6	43,200	4.67	6.69	76	32	23	4.9	77	160	4.62
8	40 5%	4	4600	6.4	46,200	5.61	5.86	91	40	28	6.0	77	200	6.20
9	50 5%	5	5000	7.8	50,400	6.12	5.58	31	28	14	5.4	77	195	8.90
10	20 10%	2	3800	4.4	48,800	2.98	6.98	83	38	30	6.6	77	200	3.76
11	30 10%	3	4400	6.5	52,000	5.21	5.86	91	40	28	6.0	77	225	6.36
12	40 10%	4	4600	9.0	60,800	5.56	5.06	99	31	17	6.7	77	300	9.60
13	50 10%	5	5000	11.0	65,600	6.10	4.43	111	37	19	6.8	77	340	12.56
14	20 20%	2	3800	6.9	64,000	4.26	5.18	63	31	19	7.4	80	125	8.59
15	30 20%	3	4400	*8.5	64,800	5.39	4.80	82	28	14	6.9	80	275	10.42
16	0.6 Max. RL	2	5400	—	44,800	3.37	7.13	119	24	16	6.0	81	235	2.70
17	0.6 Max. $\frac{1}{3}$	2	5400	8.6	52,000	6.56	4.93	86	28	10	5.3	81	250	9.24
18	0.6 Max. $\frac{2}{3}$	2	5400	*12.0	74,400	6.53	4.06	64	21	8	7.1	79	290	15.31
19	0.8 Max. RL	1	7200	—	32,000	3.25	7.73	92	25	19	4.3	79	300	2.40
20	0.8 Max. $\frac{1}{3}$	1	7200	11.1	47,200	6.53	5.32	49	28	13	4.4	79	295	12.25
21	0.8 Max. $\frac{2}{3}$	1	7200	*15.0	60,800	5.27	5.06	125	67	46	6.6	79	†500+	19.60
22	Idle	—	1400	—	69,600	2.34	5.45	56	7	6	9.7	79	95	0.71

* Motorcycle would not pull calculated load, so maximum load consistent with smooth operation was recorded † over 500°F, out of range of pyrometer

CONSTANT - SPEED EMISSIONS TEST DATA TRIUMPH T120R Motorcycle

Date 10/19/71 Atmospheric Pressure 29.14 in Hg Wet Bulb Temp. 65 °F Dry Bulb Temp. 72 °F

RUN No. 2

Mode	Condition	Gear	Engine rpm	Dyno hp	FIA	NDIR			C. L.		Polar.	Temperatures, °F		Fuel Rate, lbm/hr
					HC, ppm C	CO, %	CO_2, %	NO, ppm	NO_x, ppm	NO, ppm	O_2, %	Inlet	Exhaust	
1	Idle	——	1200	——	64,800	7.53	5.09	86	15	11	5.6	77	100	1.38
2	20 RL	2	2450	——	15,200	9.42	7.87	71	19	14	2.3	78	125	2.54
3	30 RL	2	3600	——	13,600	9.74	7.70	111	26	21	1.8	78	175	4.15
4	40 RL	3	3500	——	10,400	10.72	7.03	89	70	56	1.7	78	190	4.90
5	50 RL	3	4200	——	11,600	8.94	8.40	159	112	105	1.3	78	225	5.21
6	20 5%	2	2450	3.3	6,000	8.15	8.57	148	189	177	1.7	76	130	3.58
7	30 5%	2	3600	4.9	6,400	8.94	8.22	174	151	131	1.5	76	215	5.10
8	40 5%	3	3500	6.8	4,800	8.46	8.58	334	350	318	1.4	76	250	6.12
9	50 5%	3	4200	8.3	3,000	6.93	9.72	605	589	541	1.1	76	415	7.21
10	20 10%	2	2450	4.8	3,800	7.38	9.14	233	355	346	1.3	77	170	4.12
11	30 10%	2	3600	7.1	3,600	9.58	8.76	304	355	318	1.4	77	270	6.05
12	40 10%	3	3500	9.8	3,000	5.45	10.43	——	411	355	1.2	77	350	7.21
13	50 10%	3	4200	12.0	2,800	4.87	10.74	——	467	439	1.0	77	480	8.60
14	20 20%	2	2450	7.7	3,200	4.44	10.74	——	1495	1425	1.4	76	200	5.38
15	30 20%	2	3600	11.5	2,800	6.03	9.82	674	1004	958	1.2	76	375	7.42
16														
17														
18														
19														
20														
21														
22	Idle	——	1200	——	33,600	7.98	6.40	78	19	14	2.8	76	190	1.68

CONSTANT - SPEED EMISSIONS TEST DATA TRIUMPH T120R Motorcycle

Date 11/4/71 Atmospheric Pressure 29.24 in Hg Wet Bulb Temp. 59 °F Dry Bulb Temp. 72 °F

RUN No. 7

			Engine	Dyno	FIA	NDIR			C. L.		Polar.	Temperatures, °F		Fuel Rate,
Mode	Condition	Gear	rpm	hp	HC, ppm C	CO, %	CO₂, %	NO, ppm	NOx, ppm	NO, ppm	O₂, %	Inlet	Exhaust	lbm/hr
1	Idle	—	1200	—	54,400	9.15	4.84	86	15	13	4.7	78	100	2.20
2	20 RL	2	2450	—	26,400	11.11	6.28	64	23	17	1.3	76	135	3.02
3	30 RL	2	3600	—	32,800	10.44	6.43	108	50	40	1.9	76	175	4.41
4	40 RL	3	3500	—	24,000	9.31	6.59	116	52	51	0.9	78	200	4.49
5	50 RL	3	4200	—	12,800	9.98	7.57	145	39	33	0.8	78	250	5.57
6	20 5%	2	2450	3.3	9,400	10.12	8.09	101	88	84	0.7	76	140	3.63
7	30 5%	2	3600	4.9	9,000	9.96	7.57	137	99	94	0.8	76	245	5.21
8	40 5%	3	3500	6.8	5,400	8.36	8.62	282	225	211	0.6	76	205	5.97
9	50 5%	3	4200	8.3	5,600	6.66	9.77	566	498	488	0.5	78	355	6.71
10	20 10%	2	2450	4.8	7,200	9.31	8.09	220	169	164	0.8	78	220	4.26
11	30 10%	2	3600	7.1	5,800	8.67	8.44	282	207	216	0.7	78	325	6.13
12	40 10%	3	3500	9.8	4,800	6.22	9.77	714	686	658	0.7	80	320	7.00
13	50 10%	3	4200	12.0	4,200	4.46	11.02	—	1292	1245	0.6	78	485	7.78
14	20 20%	2	2450	7.7	4,200	6.22	9.97	—	845	775	0.8	78	330	5.27
15	30 20%	2	3600	11.5	3,400	7.42	9.37	626	540	493	0.6	78	390	7.31
16														
17														
18														
19														
20														
21														
22	Idle	—	1300	—	60,800	10.78	4.57	123	16	12	3.6	79	150	2.03

CONSTANT - SPEED EMISSIONS TEST DATA TRIUMPH T120R Motorcycle

Date 11/8/71 Atmospheric Pressure 29.33 in Hg Wet Bulb Temp. 58 °F Dry Bulb Temp. 70 °F

RUN No. 8

			Engine	Dyno	FIA	NDIR			C. L.		Polar.	Temperatures, °F		Fuel Rate,
Mode	Condition	Gear	rpm	hp	HC, ppm C	CO, %	CO_2, %	NO, ppm	NO_x, ppm	NO, ppm	O_2, %	Inlet	Exhaust	lb-/hr
1	Idle	——	1300	——	40,000	10.17	5.92	85	11	5	2.7	70	130	2.12
2	20 RL	2	2450	——	22,400	10.74	6.52	71	20	15	1.1	72	125	3.31
3	30 RL	2	3600	——	31,600	10.00	6.44	99	42	36	2.0	72	160	4.62
4	40 RL	3	3500	——	21,600	10.33	6.99	92	51	46	0.9	72	200	5.00
5	50 RL	3	4200	——	10,800	9.61	7.82	128	98	93	0.6	72	255	6.20
6	20 5%	2	2450	3.3	8,000	10.82	6.99	114	100	98	0.7	72	225	3.80
7	30 5%	2	3600	4.9	7,600	10.17	7.49	151	116	110	0.6	72	250	5.27
8	40 5%	3	3500	6.8	5,000	7.95	8.72	452	418	390	0.5	73	330	5.98
9	50 5%	3	4200	8.3	5,400	5.37	7.82	832	782	759	0.6	74	375	7.42
10	20 10%	2	2450	4.8	6,200	9.07	5.77	167	172	126	0.6	74	380	4.45
11	30 10%	2	3600	7.1	5,000	8.33	6.06	223	206	195	0.6	74	320	6.36
12	40 10%	3	3500	9.8	3,600	6.81	6.99	467	526	503	0.6	74	375	7.00
13	50 10%	3	4200	12.0	3,800	4.49	7.82	——	1098	963	0.6	75	475	8.03
14	20 20%	2	2450	7.7	4,000	6.46	10.27	738	1108	1080	0.4	75	230	5.33
15	30 20%	2	3600	11.5	4,000	7.76	9.86	762	775	748	0.4	77	390	7.31
16														
17														
18														
19														
20														
21														
22	Idle	——	1200	——	69,600	8.58	5.02	132	10	7	4.7	77	170	2.03

CONSTANT-SPEED EMISSIONS TEST DATA YAMAHA DT1-E Motorcycle

Date 10/7/71 Atmospheric Pressure 29.31 in Hg Wet Bulb Temp. 62 °F Dry Bulb Temp. 68 °F

RUN No. 1

Mode	Condition	Gear	Engine rpm	Dyno hp	FIA	NDIR			C. L.		Polar.	Temperatures, °F		Fuel Rate, lbm/hr
					HC, ppm C	CO, %	CO_2, %	NO, ppm	NO_x, ppm	NO, ppm	O_2, %	Inlet	Exhaust	
1	Idle	—	1300	—	70,400	3.89	4.31	50	7	6	11.7	74	150	0.56
2	20 RL	2	4100	—	44,000	2.01	8.44	76	40	40	3.5	74	125	1.88
3	30 RL	3	5000	—	25,600	3.60	8.11	61	32	30	3.3	74	150	1.92
4	40 RL	4	5300	—	22,400	1.97	10.70	114	66	66	3.0	74	175	2.53
5	50 RL	5	4900	—	36,000	6.62	7.18	112	57	46	4.7	74	280	5.32
6	20 5%	2	4100	2.9	27,200	1.21	10.52	77	38	32	3.5	74	160	2.17
7	30 5%	3	5000	4.3	32,000	4.12	8.85	96	54	45	4.5	74	235	4.04
8	40 5%	4	5300	6.1	34,400	6.77	7.03	98	50	39	4.8	74	375	6.53
9	50 5%	5	4900	7.4	41,600	6.78	6.89	116	69	50	5.1	74	500	8.30
10	20 10%	2	4100	4.1	32,000	3.14	9.97	78	50	42	4.6	74	200	3.35
11	30 10%	3	5000	5.2	35,200	5.84	7.95	97	54	46	5.0	74	325	5.05
12	40 10%	4	5300	8.4	41,600	6.65	6.73	98	57	44	5.5	74	465	8.59
13	50 10%	5	4900	10.2	47,200	5.89	7.11	162	114	96	6.4	74	†500+	10.20
14	20 20%	2	4100	6.3	35,200	7.48	7.49	119	62	54	5.0	74	410	5.90
15	30 20%	3	5000	9.3	44,800	6.78	6.89	148	87	73	6.1	74	500	8.90
16	0.6 Max. RL	3	4500	—	32,000	0.49	9.44	85	36	33	5.1	74	140	2.27
17	0.6 Max. $\frac{1}{3}$	3	4500	5.8	33,600	5.12	8.11	97	53	46	4.2	74	225	4.62
18	0.6 Max. $\frac{2}{3}$	3	4500	9.2	40,000	5.59	7.26	199	123	118	3.9	74	425	8.03
19	0.8 Max. RL	2	6000	—	20,800	2.52	10.52	105	66	57	2.7	74	410	2.26
20	0.8 Max. $\frac{1}{3}$	2	6000	7.7	28,000	5.72	7.49	97	73	68	3.4	74	425	6.80
21	0.8 Max. $\frac{2}{3}$	2	6000	12.9	35,200	6.62	7.18	151	96	82	3.9	74	†500+	10.65
22	Idle	—	1300	—	75,200	4.19	4.19	40	8	5	10.7	74	175	0.58

† over 500°F, out of range of pyrometer

CONSTANT-SPEED EMISSIONS TEST DATA YAMAHA DT1-E Motorcycle

Date 10/7/71 Atmospheric Pressure 29.27 in Hg Wet Bulb Temp. 64 °F Dry Bulb Temp. 72 °F

RUN No. 2

			Engine	Dyno	FIA	NDIR			C.L.		Polar.	Temperatures, °F		Fuel Rate,
Mode	Condition	Gear	rpm	hp	HC, ppm C	CO, %	CO_2, %	NO, ppm	NO_x, ppm	NO, ppm	O_2, %	Inlet	Exhaust	lbm/hr
1	Idle	—	1300	—	76,000	3.48	4.19	61	7	5	9.9	74	110	0.65
2	20 RL	2	4100	—	51,000	0.74	8.27	111	50	50	6.2	74	125	1.95
3	30 RL	3	5000	—	21,600	3.54	9.80	74	35	27	2.6	74	145	2.02
4	40 RL	4	5300	—	20,800	1.34	10.62	108	66	59	2.7	74	160	3.08
5	50 RL	5	4900	—	32,800	5.15	7.49	119	59	53	2.7	74	250	5.00
6	20 5%	2	4100	2.9	26,400	1.85	10.16	78	37	30	3.4	74	210	2.06
7	30 5%	3	5000	4.3	26,800	2.90	9.27	113	61	54	3.4	74	240	3.38
8	40 5%	4	5300	6.1	36,000	6.14	7.64	90	52	42	4.3	74	325	6.36
9	50 5%	5	4900	7.4	44,000	7.24	6.73	105	55	46	4.8	74	450	7.90
10	20 10%	2	4100	4.1	32,000	4.51	9.10	110	49	45	3.7	74	300	4.33
11	30 10%	3	5000	5.2	33,600	5.12	8.12	125	57	48	4.1	74	340	5.00
12	40 10%	4	5300	8.4	42,400	7.24	6.73	120	60	52	4.5	74	360	7.20
13	50 10%	5	4900	10.2	46,400	5.91	6.89	192	119	110	5.3	74	†500+	10.00
14	20 20%	2	4100	6.3	39,200	6.03	7.34	69	53	43	4.1	74	305	5.98
15	30 20%	3	5000	9.3	46,400	6.21	6.59	84	75	66	5.0	74	480	9.42
16	0.6 Max. RL	3	4500	—	25,600	4.29	8.93	55	29	23	3.1	74	375	1.75
17	0.6 Max. $\frac{1}{3}$	3	4500	5.8	30,400	5.43	7.64	76	57	51	3.9	74	250	4.53
18	0.6 Max. $\frac{2}{3}$	3	4500	9.2	39,200	5.47	6.89	199	165	160	4.6	74	380	7.78
19	0.8 Max. RL	2	6000	—	23,200	4.66	8.93	40	33	27	2.6	74	350	1.91
20	0.8 Max. $\frac{1}{3}$	2	6000	7.7	28,000	7.67	7.03	98	59	50	3.0	74	410	8.60
21	0.8 Max. $\frac{2}{3}$	2	6000	12.9	32,000	6.76	7.26	162	105	100	3.6	74	†500+	12.25
22	Idle	—	1300	—	78,400	4.77	3.83	61	7	5	9.4	74	210	0.61

† over 500°F, out of range of pyrometer

APPENDIX E

Reproductions of Speed and Smoke Opacity Traces for the 2-Stroke Motorcycles Operated on the LA-4 Route

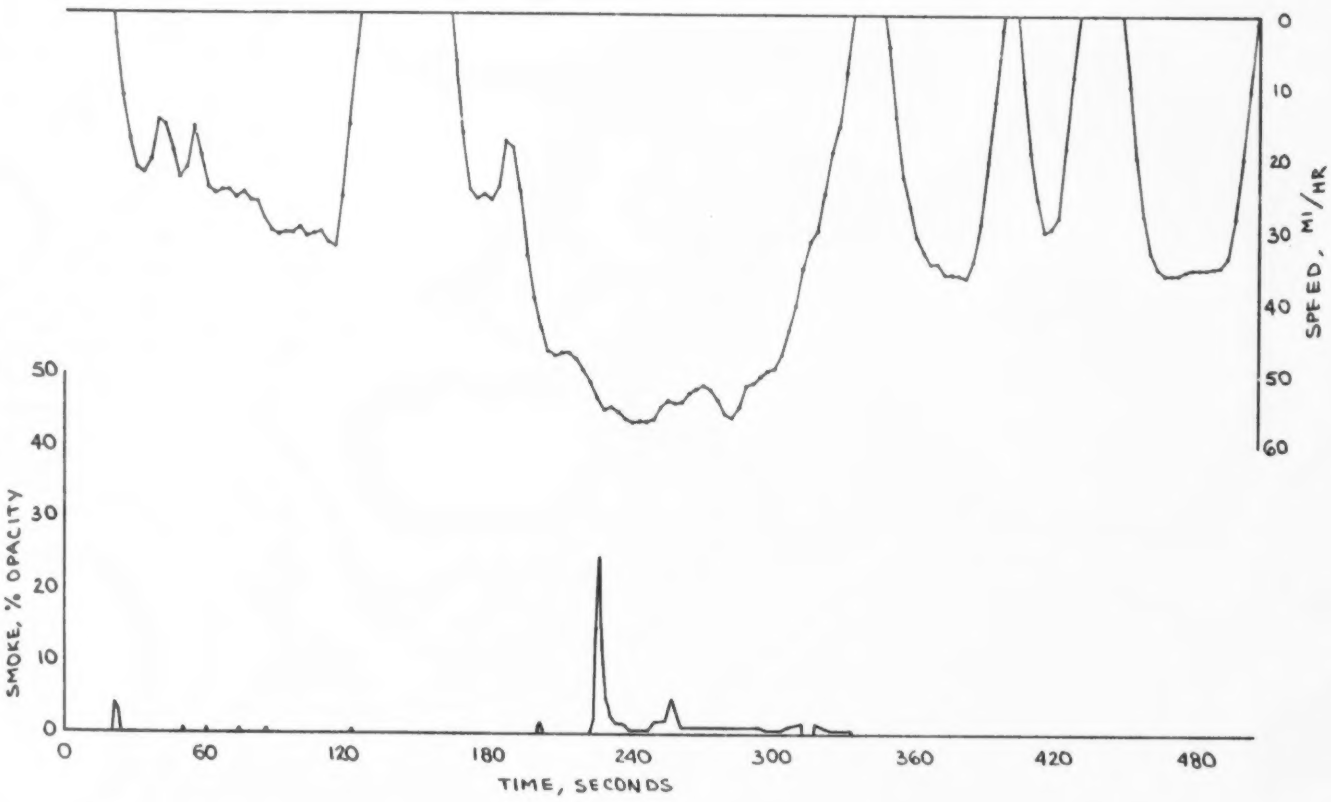

FIGURE E-1. SMOKE OPACITY AND SPEED AS A FUNCTION OF TIME FOR THE KAWASAKI 125F-6 MOTORCYCLE OPERATED OVER THE FIRST 505 SECONDS OF THE LA-4 ROUTE (2-INCH PIPE)

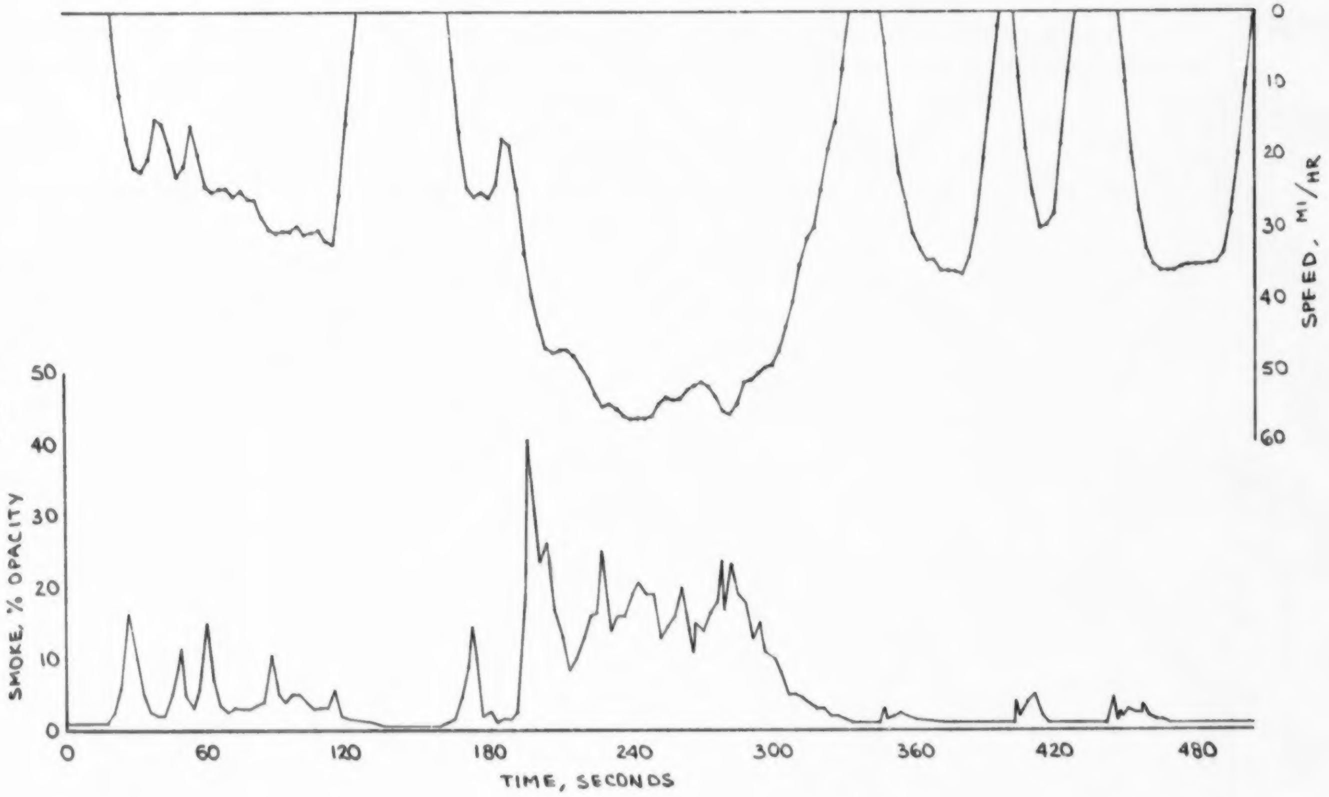

FIGURE E-2 SMOKE OPACITY AND SPEED AS A FUNCTION OF TIME FOR THE SUZUKI T250 MOTORCYCLE OPERATED OVER THE FIRST 505 SECONDS OF THE LA-4 ROUTE (3-INCH PIPE)

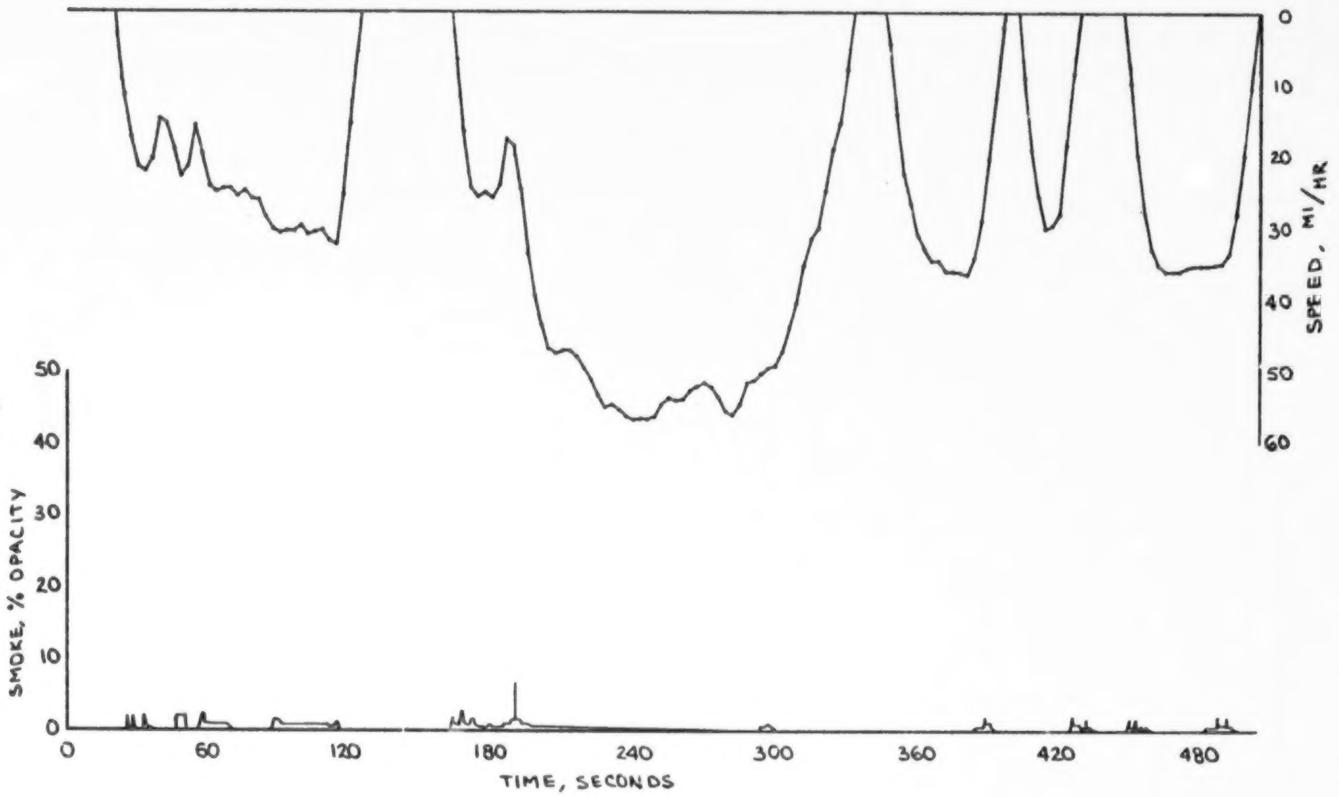

FIGURE E-3. SMOKE OPACITY AND SPEED AS A FUNCTION OF TIME FOR THE YAMAHA DT1-E MOTORCYCLE OPERATED OVER THE FIRST 505 SECONDS OF THE LA-4 ROUTE (2-INCH PIPE)

* U.S.Government Printing Office: 1974--746-772/4201 Region No. 4